NASA SP-7011 (373)
March 1993

P-74

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

NASA STI PROGRAM
SCIENTIFIC & TECHNICAL INFORMATION

NASA SP-7011 (373)
March 1993

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

National Aeronautics and Space Administration
Scientific and Technical Information Program
Washington, DC 1993

This publication was prepared by the NASA Center for AeroSpace Information,
800 Elkridge Landing Road, Linthicum Heights, MD 21090-2934, (301) 621-0390.

INTRODUCTION

This issue of *Aerospace Medicine and Biology* (NASA SP-7011) lists 206 reports, articles and other documents originally announced in February 1993 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of *Aerospace Medicine and Biology* was published in July 1964.

Accession numbers cited in this issue are:

STAR (N-10000 Series)	N93-12544 — N93-15658
IAA (A-10000 Series)	A93-13741 — A93-17520

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the publication consists of a standard bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations include the original accession numbers from the respective announcement journals.

Seven indexes—subject, personal author, corporate source, foreign technology, contract, report number, and accession number—are included.

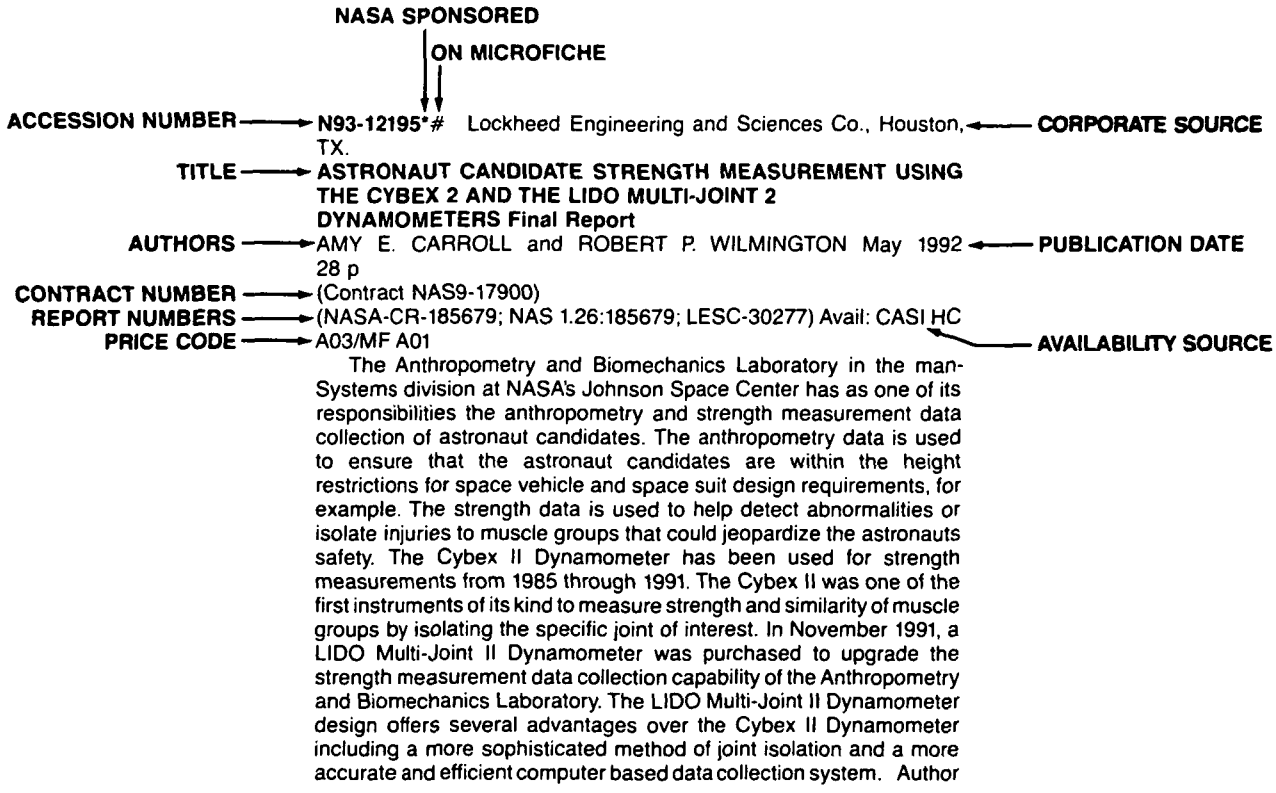
A cumulative index for 1993 will be published in early 1994.

Information on availability of documents listed, addresses of organizations, and CASI price schedules are located at the back of this issue.

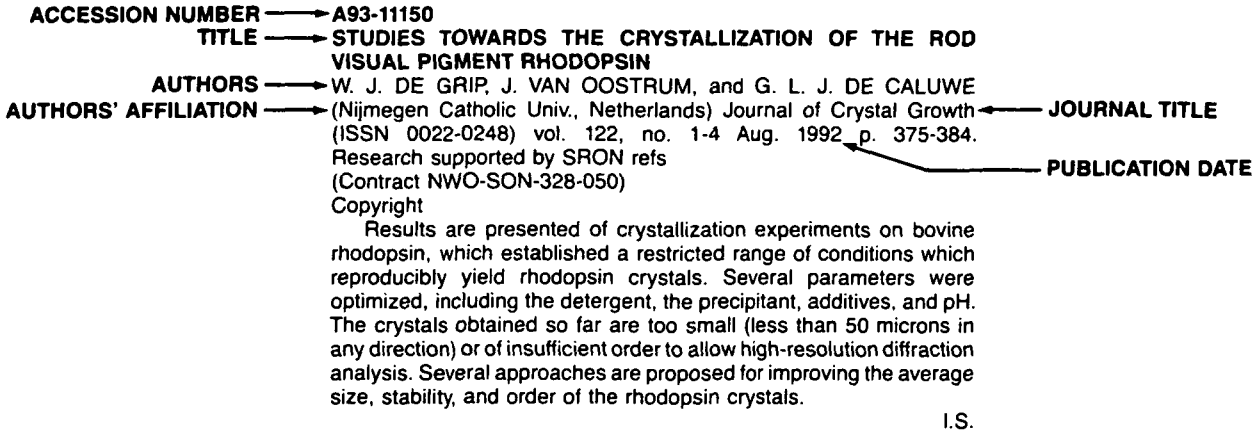
TABLE OF CONTENTS

PAGE iv INTENTIONALLY BLANK

TYPICAL REPORT CITATION AND ABSTRACT



TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT



AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 373)

March 1993

51

LIFE SCIENCES (GENERAL)

A93-14121* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
THE EFFECTS OF GROWTH TEMPERATURE ON THE METHYL STEROL AND PHOSPHOLIPID FATTY ACID COMPOSITION OF METHYLOCOCCUS CAPSULATUS (BATH)
LINDA L. JAHNKE (NASA, Ames Research Center, Moffett Field, CA) FEMS Microbiology Letters (ISSN 0378-1097) vol. 93 1992 p. 209-212. refs
Copyright

Growth of Methylococcus capsulatus (Bath) at temperatures ranging from 30 to 50 C resulted in changes to the whole cell lipid constituents. As temperature was lowered, the overall proportion of hexadecenoic acid (C16:1) increased, and the relative proportions of the Delta9, Delta10, and Delta11 C16:1 double bond positional isomers changed. Methyl sterol content also increased as the growth temperature was lowered. The highest amounts of methyl sterol were found in 30 C cells and the lowest in 50 C cells (sterol-phospholipid ratios of 0.077 and 0.013, respectively). The data are consistent with a membrane modulating role for the sterol produced by this prokaryotic organism. Author

A93-14970* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
MYOSIN HEAVY CHAIN COMPOSITION IN THE RAT DIAPHRAGM - EFFECT OF AGE AND EXERCISE TRAINING
LUC E. GOSSELIN, MICHAEL BETLACH, ARTHUR C. VAILAS, MARION L. GREASER, and D. P. THOMAS (Wisconsin Univ., Madison; Wyoming Univ., Laramie) Journal of Applied Physiology (ISSN 8750-7587) vol. 73, no. 4 Oct. 1992 p. 1282-1286. Research supported by Univ. of Wisconsin refs
(Contract NAG2-568)
Copyright

The effects of aging and exercise training on the myosin heavy chain (MHC) composition were determined in both the costal and crural diaphragm regions of female Fischer 344 rats. Treadmill running at 75 percent maximal oxygen consumption resulted in similar increases in plantaris muscle citrate synthase activity in both young (5 mo) and old (23mo) trained animals (P less than 0.05). It was found that the ratio of fast to slow MHC was significantly higher (P less than 0.005) in the crural compared with costal diaphragm region in both age groups. A significant age-related increase in persentage of slow MHC was observed in both diaphragm regions. The relative proportion of slow MHC in either costal or crural region was not changed by exercise training. O.G.

A93-14973
HYPOXIA-INDUCED DOWNREGULATION OF BETA-ADRENERGIC RECEPTORS IN RAT HEART
RACHID KACIMI, JEAN-PAUL RICHALET, ALAIN CORSIN, ISABELLE ABOUSAHL, and BERTRAND CROZATIER (Inst. National de la Recherche Scientifique, Creteil; Association pour la Recherche en Physiologie de l'Environnement, Bobigny; Labs. Sandoz, Rueil, France) Journal of Applied Physiology (ISSN 8750-7587) vol. 73, no. 4 Oct. 1992 p. 1377-1382. Research supported by Labs. Sandoz refs
Copyright

The possible mechanisms of hypoxia-induced beta-adrenergic receptors (AR) desensitization were studied with particular attention given to coupling between beta-AR and G proteins in nonhypertrophied left ventricle. Data obtained support the beta-AR downregulation hypothesis as one of the mechanisms of myocardial adaptation to high altitude after 2-3 wk of exposure to hypoxia. O.G.

A93-14974* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
RAT CARDIOVASCULAR RESPONSES TO WHOLE BODY SUSPENSION - HEAD-DOWN AND NON-HEAD-DOWN TILT
X. J. MUSACCHIA, JOSEPH M. STEFFEN, and JUDY DOMBROWSKI (Louisville Univ., KY) Journal of Applied Physiology (ISSN 8750-7587) vol. 73, no. 4 Oct. 1992 p. 1504-1509. Research supported by Univ. of Louisville and Southern Regional Education Board refs
(Contract NAG2-386)
Copyright

Two experiments aimed at examining the versatility of the whole body suspension (WBS) system as a ground-based model for cardiovascular effects of microgravity are described. The first experiment studied heart rate and arterial pressure responses in rats during a 7-day period of head-down tilt (HDT) or nonhead-down tilt (NHDT) and after removal from whole body suspension (WBS). Mean arterial (MAP), systolic, and diastolic pressures increased about 20 percent in HDT rats on the fist day, heart rates were elevated about 10 percent. During postsuspension most cardiovascular parameters returned to presuspension levels. The second experiment evaluated responses to rapid head-up tilt in HDT and NHDT rats. It was observed that, while pulse pressures remained unchanged, MAP, systolic and diastolic pressures, and HR were elevated in HDT and NHDT rats during head-up tilt after one day of suspension. The WBS rats are considered to be useful as a model to better understand responses of rats exposed to microgravity. O.G.

A93-15526
BEHAVIORAL ADAPTATION TO SUSTAINED HYPOBARIC HYPOXIA MANIFESTED BY TIMING BEHAVIOR IN RATS. I
IZO SAKURAI (Japan Self Defense Force, Central Hospital, Tokyo, Japan), TSUNEHISA SATO, TOSHITADA YOSHIOKA (St. Marianna Univ., Kawasaki, Japan), and RYOHEI YURUGI (Kagawa Nutrition College, Sakato, Japan) Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723) vol. 29, no. 2 June 1992 p. 39-43. refs
Copyright

Operant techniques were used in an attempt to assess the process of adaptation to sustained hypobaric hypoxia in rats. The rats were trained on differential reinforcement of low rate 15 sec with a limited hold 5 sec schedule under normoxic environment. After stable baselines had been established, they were continuously exposed to a simulated altitude of 18,000 ft for one week and changes of operant behavior were examined. The response and the reinforcement rates declined precipitously during the first few

days of the exposure, and then returned gradually to the control sea levels. The results suggest that an analysis of operant behavior in animals would be a useful parameter in determining the adaptation process to hypoxic environment. Author

A93-15527
ADAPTATION OF SKELETAL MUSCLES AND PHYSICAL WORK CAPACITY IN A WEIGHTLESS ENVIRONMENT
YOSHINOBU OHIRA, NAOTAKE INOUE, and TOHRU WAKATSUKI (National Inst. of Fitness and Sports, Kanoya, Japan) Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723) vol. 29, no. 2 June 1992 p. 51-54. In Japanese. refs
Copyright

Research on skeletal muscle atrophy due to limited exercise during a long-duration space flight is presented. The characteristics of muscular contraction are discussed, and muscle fiber types and physical work capacity in a weightless environment are studied. Y.P.Q.

A93-16001
THE CURRENT STATUS AND PROSPECTS IN THE STUDY OF CELL PHYSIOLOGY UNDER MICROGRAVITY
CHENGXIAN LIU Aerospace China (ISSN 1002-7742) no. 172 Aug. 1992 p. 3-6. In Chinese.

A brief introduction to the question about role of gravity in cell physiology and advances in the study of adaptive reactions of cells to microgravity are given in this article. The emphasis is on introducing the current status and prospects in the study of microgravity cell physiology in space bioprocessing. Author

A93-16481
MAGNETIC DOMAIN STATE AND COERCIVITY PREDICTIONS FOR BIOGENIC GREIGITE (FE3S4) - A COMPARISON OF THEORY WITH MAGNETOSOME OBSERVATIONS
JUAN C. D. RICCI and JOSEPH L. KIRSCHVINK (California Inst. of Technology, Pasadena) Journal of Geophysical Research (ISSN 0148-0227) vol. 97, no. B12 Nov. 10, 1992 p. 17,309-17,315. refs
(Contract NIH-GM-41635)
Copyright

The discovery of bacteria that precipitate greigite within intracellular organelles (magnetosomes) offers new evidence about the origin of greigite in natural environments. Unlike magnetite, only scarce information is available about the magnetic characteristics of greigite. For this reason, and the present inability to grow these microorganisms in pure culture, it is not known whether or not the magnetosomes in the newly discovered greigite-precipitating bacteria are of single-domain (SD) size, as are the magnetosomes from magnetite-precipitating bacteria. The hypothesis of natural selection for magnetotactic behavior predicts that the greigite-bearing magnetosomes should also be single magnetic domains. Using previously reported magnetic properties and crystallographic features for greigite, we have calculated the size and shape boundaries expected for SD and superparamagnetic (SPM) behavior in this mineral. For further characterization of the greigite crystals, we analyzed the domain state at various length/width ratios assuming crystal shapes of parallelepieds and prolate spheroids. Magnetite was used as control for the current theories supporting these calculations. We also present a simple algorithm to calculate the upper size limit of single-domain grains. Our results show that the crystals of bacterial greigite characterized so far are located in the region close to the single-domain superparamagnetic boundary and should have relatively low coercivity. If these crystals contribute to the magnetization of sediments, remanence produced by bacterial greigite could be mistaken for large, multidomain magnetite in alternating field demagnetization studies. Author

A93-16544* National Aeronautics and Space Administration, Washington, DC.
METHANE TRANSPORT MECHANISMS AND ISOTOPIC FRACTIONATION IN EMERGENT MACROPHYTES OF AN ALASKAN TUNDRA LAKE
JEFFREY P. CHANTON (Florida State Univ., Tallahassee), CHRISTOPHER S. MARTENS, CHERYL A. KELLEY (North Carolina Univ., Chapel Hill), PATRICK M. CRILL (New Hampshire Univ., Durham), and WILLIAM J. SHOWERS (North Carolina State Univ., Raleigh) Journal of Geophysical Research (ISSN 0148-0227) vol. 97, no. D15 Oct. 30, 1992 p. 16,681-16,688. refs
(Contract NAGW-593; NAGW-834; NAGW-1823)
Copyright

The stable carbon isotopic composition of methane associated with and emitted by the two dominant emergent macrophytes abundant in the many Alaskan tundra lakes, Carex rostrata and Arctophila fulva, is determined. The carbon isotopic composition of the methane was -58.6 +/- 0.5 (n=2) for Arctophila and -66.6 +/- 2.5 (n=6) for Carex. The methane emitted by these species is depleted in C-13 by 12 per mil for Arctophila and 18 per mil for Carex relative to methane withdrawn from plant stems 1-2 cm below the waterline. The results suggest more rapid transport of (C-12)H4 relative to (C-13)H4 through plants to the atmosphere. Plant stem methane concentrations ranged from 0.2 to 4.0 percent in Arctophila, with an isotopic composition of -46.1 +/- 4.3 percent (n=8). Carex stem methane concentrations ranged from 150 to 1200 ppm, with an isotopic composition of -48.3 +/- 1.4 per mil (n=3). C.D.

A93-16748
THE ROLE OF DERMORPHIN IN THE REGULATION OF THE WINTER HIBERNATION PROCESSES IN MAMMALS [ROL' DERMORFINA V REGULIATSII PROTSESSOV ZIMNEI SPIACHKI U MLEKOPITAIUSHCHIKH]
T. N. SOLLERTINSKAIA, E. N. NURITDINOV, and M. F. OBUKHOVA (RAN, Inst. Evoliutsionnoi Fiziologii i Biokhimii, St. Petersburg; NII Normal'noi Fiziologii, Moscow, Russia) Fiziologicheskii Zhurnal (ISSN 0015-329X) vol. 78, no. 4 April 1992 p. 1-13. In Russian. refs
Copyright

The effects of an opioid neuropeptide, dermorphine, and of its conjugate on the conditioned reflex activity of hibernating mammals were investigated in alert and hibernating susliks. It was found that the administration of dermorphin (0.1 mg/kg, given s.c.) to alert susliks caused a lowering of the body temperature, a deceleration of initial vegetative parameters, and the developemnt of a hibernationlike state; the delayed effects included a disruption in conditioned reflex activity. The immunization of hibernating susliks with a dermorphin conjugate led to a gradual waking up of the animals, the normalization of conditioning, and the appearance of the motor component in the avoidance conditioning. I.S.

A93-16749
VAGOTROPIC EFFECTS OF PEPTIDES ISOLATED FROM THE BRAIN OF HIBERNATING SUSLIKS [VAGOTROPNOE DEISTVIE PEPTIDOV, VYDELENNYKH IZ MOZGA GIBERNIRUIUSHCHIKH SUSLIKOV]
V. M. POKROVSKII, O. E. OSADCHII, IU. R. SHEIKH-ZADE, V. I. SVIRIAEV, B. V. VAS'KOVSKII, R. KH. ZIGANSHIN, and I. I. MIKHALEVA (Kubanskii Meditsinskii Inst., Krasnodar; RAN, Inst. Bioorganicheskoi Khimii, Moscow, Russia) Fiziologicheskii Zhurnal (ISSN 0015-329X) vol. 78, no. 4 April 1992 p. 26-31. In Russian. refs
Copyright

Effects of peptides isolated from the brain tissue of hibernating susliks on the magnitude of the vagal cardiochronotropic effect and its tonic and synchronizing components in anesthetized cats were investigated. It was found that the ASP-TYR dipeptide had a potent vagal effect on the cardiac rhythm, whereas the THR-SER-LYS-TYR-ARG pentapeptide depressed the vagal effect. In both cases, the effect was related to an alteration of the strength of the tonic component strength of the vagal chronotropic effect.

The results suggest different physiological roles of the tonic and the synchronizing components in the regulation of the heart activity. I.S.

A93-16750
EFFECT OF HIGH TEMPERATURE ON THE BETA-ADRENORECEPTOR ACTIVITY AND THE CATECHOLAMINE SYNTHESIS [DEISTVIE VYSOKOI TEMPERATURY NA AKTIVNOST' BETA-ADRENORETSEPTOROV I SINTEZ KATEKHOLAMINOV]
B. N. MANUKHIN, F. F. SULTANOV, B. K. SHAIYMOV, and KH. A. MEZIDOVA (RAN, Inst. Biologii Razvitiia, Moscow, Russia; RAN, Inst. Fiziologii i Patologii Aridnoi Zony, Ashkhabad, Turkmenistan) Fiziologicheskii Zhurnal (ISSN 0015-329X) vol. 78, no. 4 April 1992 p. 102-107. In Russian. refs
Copyright

The effect of hyperthermia (60 min at 45 C) on the binding of H-3-dihydroalprenolol and H-3-chinuclidinylbenzylate, the specific inhibitors of beta-adrenoreceptors and M-cholinreceptors, respectively, by the synaptosomes of the hypothalamus and the brain cortex of rats was investigated. It was found that body hypothermia and overheating of isolated organs led to significant lowering in the binding capability of these specific receptors. I.S.

A93-17426
A LUNAR-BASED CHEMICAL ANALYSIS LABORATORY
CYRIL PONNAMPERUMA, ED. (Maryland Univ., College Park) and CHARLES W. GEHRKE, ED. (Missouri-Columbia Univ., Columbia) Hampton, VA A. Deepak Publishing 1992 303 p.
(ISBN 0-937194-25-5) Copyright

Various papers on a Lunar-Based Chemical Analysis Laboratory (LBCAL) are presented. Individual topics addressed include: role of LBCAL; supporting human exploration in space: biomedical research; recommended radiobiological studies for an LBCAL; operational medicine on the lunar base; crew factors; controlled ecological life support system; chemical and toxicological assessment of environmental contaminants in the LBCAL; free radical attack: biological test for human resistance capability; exobiology objectives at a lunar base; planetary science and resource utilization at a lunar outpost: chemical analytical facility requirements; geoscience investigations conducted from a lunar base. Also discussed are: lunar surface processes; chronobiology in a moon-based chemical analysis and physiological monitoring laboratory; human stress - measurement and consequences; elemental analysis needs in a LBCAL; molecular mechanisms of stress; role of automation and robotics in the LBCAL; requirements for a data and information management system to support a LBCAL; detection of genetic effects of excess near-UV irradiation under exobiology conditions. (For individual items see A93-17427 to A93-17446) C.D.

A93-17429
RECOMMENDED RADIOBIOLOGICAL STUDIES FOR A LUNAR-BASED CHEMICAL/BIOLOGICAL/MEDICAL ANALYSIS LABORATORY (LBCAL)
K. S. KUMAR, J. F. WEISS, E. P. CLARK (DNA, Armed Forces Radiobiology Research Inst., Bethesda, MD), and CYRIL PONNAMPERUMA (Maryland Univ., College Park) *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 40-50. refs
Copyright

Radiation effects related to space are reviewed and a ground-based comparative study of the effects of gamma photons, high energy and charge particles, protons, and neutrons in animal model systems is proposed. The proposed studies are intended to estimate long-term radiation risk assessments, refine biological rediation dosimetry, and develop chemical radioprotectors with low behavioral toxicity. C.D.

A93-17434
FREE RADICAL ATTACK - BIOLOGICAL TEST FOR HUMAN RESISTANCE CAPABILITY
DENIS BLACHE (Inst. National de la Sante et de la Recherche Medicale, Bron, France) and MICHEL PROST (Centre Europeen de Recherches et d'Analyses, Dijon, France) *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 82-98. refs
Copyright

A simple biological test to measure the total antioxidative defense status of individuals utilizing circulating cells is presented. Application of the test to studies of antioxidant capability of compounds in the presence of cells, studies of metabolic alterations of cells, and studies on cells isolated from subjects is addressed. C.D.

A93-17446
DETECTION OF GENETIC EFFECTS OF EXCESS NEAR-ULTRAVIOLET IRRADIATION UNDER EXOBIOLOGY CONDITIONS
ABRAHAM EISENSTARK (Missouri-Columbia Univ.; Cancer Research Center, Columbia) *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 261-274. refs
Copyright

The exobiological effects of near-ultraviolet (NUV) radiation are addressed. Models of NUV action are summarized. Experiments to investigate NUV photoreceptors and oxidative photoproducts of NUV are suggested. C.D.

N93-12768# Georgia Univ., Athens.
NITROGEN CONTROL OF CHLOROPLAST DEVELOPMENT AND DIFFERENTIATION
G. W. SCHMIDT Dec. 1991 5 p
(Contract DE-FG09-84ER-13188)
(DE92-017392; DOE/ER-13188/7) Avail: CASI HC A01/MF A01

The growth and development of plants and photosynthetic microorganisms is commonly limited by the availability of nitrogen. Our work concerns understanding the mechanisms by which plants and algae that are subjected to nitrogen deprivation alter the composition of photosynthetic membranes and enzymes involved in photosynthetic carbon metabolism. Toward these ends, we study biosynthetic and gene expression processes in the unicellular green alga Chlamydomonas reinhardtii which is grown in an ammonium-limited continuous culture system. We have found that the expression of nuclear genes, including those encoding for light-harvesting proteins, are severely repressed in nitrogen-limited cells whereas, in general, chloroplast protein synthesis is attenuated primarily at the level of mRNA translation. Conversely, nitrogen deprivation appears to lead to enhanced synthesis of enzymes that are involved in starch and storage lipid deposition. In addition, as a possible means by which photosynthetic electron transport activities and ATP synthesis is sustained during chronic periods of nitrogen deprivation, thylakoid membranes become enriched with components for chlororespiration. Characterization of the chlororespiratory electron transport constituents, including cytochrome complexes and NAD(P)H dehydrogenase is a major current effort. Also, we are striving to isolate the genes encoding chlororespiration proteins toward determining how they and others that are strongly responsive to nutrient availability are regulated. DOE

N93-12871# Mote Marine Lab., Sarasota, FL.
PHYTOPLANKTON PHOTOSYNTHESIS IN NATURAL MIXED LAYERS Final Technical Report
GARY KIRKPATRICK 1992 1 p
(Contract N00014-91-J-1653)
(AD-A255010) Avail: CASI HC A01/MF A01

This report describes the technical accomplishments of the subject grant. This work forms a part of a broader, ongoing effort to more completely describe the physiological responses of marine phytoplankton species to the time-course of natural solar radiation variation on time scales of minutes to days. The investigative approach involves in situ instrumentation, laboratory observations and computer models. Collaborators on this ongoing project include Daniel Kamykowski, Thomas Curtin, Gerald Janowitz and Hidekatsu Yamazaki. The objective of the work under the subject grant was

to develop the capability to conduct simultaneous, in situ comparison studies of the photosynthetic responses within and between selected phytoplankton species under natural irradiance fluctuation utilizing the Self-contained Underwater Photosynthesis Apparatus (SUPA). This objective was met by fabricating a twin SUPA based on the existing design and incorporating the necessary modifications to hardware and software to permit simultaneous operation from existing support equipment. GRA

N93-12901*# Alabama Univ., Huntsville. Dept. of Biological Sciences.
ESTABLISHING LABORATORY STANDARDS FOR BIOLOGICAL FLIGHT EXPERIMENTS Final Report
RONALD B. YOUNG and DEBRA M. MORIARITY 1989 4 p
(Contract NAS8-36955)
(NASA-CR-184402; NAS 1.26:184402) Avail: CASI HC A01/MF A01

The general objective of this research was to assess the effects of exposure to simulated microgravity on ultrastructural aspects of the contractile system in chicken skeletal muscle cells. This general objective had two specific experimental components: (1) the progression of changes in cell morphology, fusion, and patterns of contractile filament organization in muscle cell cultures grown in hollow fibers in the Clinostat were evaluated, with appropriate controls; (2) to initiate experiments in which muscle cells were grown on the surface of microcarrier beads. The ultimate objective of this second portion of the work is to determine if these beads can be rotated in a bioreactor and thereby obtain a more accurate approximation of the effects of simulated microgravity on differentiated muscle cells. Author

N93-12949*# Alabama Univ., Huntsville. Environmental Lab. Section.
METHODS DEVELOPMENT FOR TOTAL ORGANIC CARBON ACCOUNTABILITY Final Report, 1 Nov. 1990 - 30 Apr. 1991
BRIAN L. BENSON and MELVIN V. KILGORE, JR. 30 Apr. 1991 140 p
(Contract NAS8-36955)
(NASA-CR-184438; NAS 1.26:184438) Avail: CASI HC A07/MF A02

This report describes the efforts completed during the contract period beginning November 1, 1990 and ending April 30, 1991. Samples of product hygiene and potable water from WRT 3A were supplied by NASA/MSFC prior to contract award on July 24, 1990. Humidity condensate samples were supplied on August 3, 1990. During the course of this contract chemical analyses were performed on these samples to qualitatively determine specific components comprising, the measured organic carbon concentration. In addition, these samples and known standard solutions were used to identify and develop methodology useful to future comprehensive characterization of similar samples. Standard analyses including pH, conductivity, and total organic carbon (TOC) were conducted. Colorimetric and enzyme linked assays for total protein, bile acid, B-hydroxybutyric acid, methylene blue active substances (MBAS), urea nitrogen, ammonia, and glucose were also performed. Gas chromatographic procedures for non-volatile fatty acids and EPA priority pollutants were also performed. Liquid chromatography was used to screen for non-volatile, water soluble compounds not amenable to GC techniques. Methods development efforts were initiated to separate and quantitate certain chemical classes not classically analyzed in water and wastewater samples. These included carbohydrates, organic acids, and amino acids. Finally, efforts were initiated to identify useful concentration techniques to enhance detection limits and recovery of non-volatile, water soluble compounds. Author

N93-13033# Joint Publications Research Service, Arlington, VA.
JPRS REPORT: SCIENCE AND TECHNOLOGY. CENTRAL EURASIA: LIFE SCIENCES
30 Oct. 1992 63 p Transl. into ENGLISH from various Russian articles
(JPRS-ULS-92-024) Avail: CASI HC A04/MF A01

Papers on the following topics are presented: the environment; epidemiology; medicine; molecular biology; pharmacology and toxicology; public health; phychology; and radiation biology. L.R.R.

N93-13034# Louisiana State Univ., Baton Rouge.
A PHYSICO-CHEMICAL STUDY OF SOME AREAS OF FUNDAMENTAL SIGNIFICANCE TO BIOPHYSICS
S. P. MCGLYNN and D. KUMAR 30 Apr. 1992 66 p
(Contract DE-FG05-87ER-60503)
(DE92-019917; DOE/ER-60503/353) Avail: CASI HC A04/MF A01

This report discusses the following topics on biophysics: radiation signatures; electronic structure of steroids and vitamins; laser optogalvanic effect; vacuum ultraviolet spectroscopy; and ozone. DOE

N93-13083# Louisiana State Univ., Baton Rouge. Dept. of Chemistry.
A PHYSICO-CHEMICAL STUDY OF SOME AREAS OF FUNDAMENTAL SIGNIFICANCE TO BIOPHYSICS
S. P. MCGLYNN and D. KUMAR 30 Apr. 1992 99 p
(Contract DE-FG05-87ER-60503)
(DE92-019916; DOE/ER-60503/352) Avail: CASI HC A05/MF A02

This report discusses the following topics: radiation signatures; photoelectron spectroscopy of biologically active molecules; laser optogalvanic effect; magnetic circular dichroism; photochemistry of halogenated molecules; and density effects on high-n rydbergs. DOE

N93-13167*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
A STUDY OF THE EFFECTS OF MICRO-GRAVITY ON SEED GERMINATION
LYNN SUZANNE KLEIN (Washington Univ., Seattle.), MARK MCKIBBEN (Ohio Univ., Athens.), DAVID A. BRAIN (Rice Univ., Houston, TX.), THEODORE C. JOHNSON (Stanford Univ., CA.), and KONRAD K. DANNENBERG *In* NASA. Goddard Space Flight Center, The 1992 Shuttle Small Payloads Symposium p 85-94 Oct. 1992
Avail: CASI HC A02/MF A03

This study will identify characteristics of seed germination dependent upon gravity. To accomplish this objective, four different seed types will be germinated in space and then be compared to a control group germinated on Earth. Both the experimental and control groups will be analyzed on the cellular level for the size of cells, structural anomalies, and gravitational effects. The experiment will be conducted in a Get Away Special Canister (GAS Can no. 608) owned by the U.S. Space and Rocket Center and designed for students. The GAS Can will remain in the cargo bay of the Space Shuttle with minimal astronaut interaction. Author

N93-13269# Arkansas Univ., Fayetteville. Coll. of Engineering.
BIOLOGICAL CONVERSION OF SYNTHESIS GAS
1 Apr. 1992 23 p
(Contract DE-FG21-90MC-27225)
(DE92-017673; DOE/MC-27225/T5) Avail: CASI HC A03/MF A01

The anaerobic, photosynthetic bacterium Rhodospirillum rubrum has been chosen for catalysis of the biological water gas shift reaction. In addition, two other anaerobic, photosynthetic bacteria, Chlorobium thiosulfatophilum and Chloroblum phaeobacteroides, have been evaluated as candidates for H2S conversion to elemental sulfur. Growth and H2S uptake studies in the presence of basal medium indicated that C. thiosulfatophilum is a much superior organism. C. phaeobacteroides showed sporatic growth at best, with growth always slower than C. thiosulfatophilum. Also, when C. phaeobacteroides experienced slow growth, no H2S consumption was observed. C. thiosulfatophilum always showed superior growth and H2S uptake, and thus will be selected as the bacterium for H2S conversion to elemental sulfur. DOE

N93-13327*# National Academy of Sciences - National Research Council, Washington, DC. Commission on Physical Sciences, Mathematics, and Applications.

ASSESSMENT OF PROGRAMS IN SPACE BIOLOGY AND MEDICINE

1991 79 p

(Contract NASW-4102)

(NASA-CR-190930; NAS 1.26:190930) Avail: CASI HC A05/MF A01

Over the past 30 or more years, the National Research Council Space Studies Board and its various committees have published hundreds of recommendations concerning life sciences research. Several particularly noteworthy themes appear consistently: (1) Balance - the need for a well-balanced research program in terms of ground versus flight, basic versus clinical, and internal versus extramural; (2) Excellence - because of the extremely limited number of flight opportunities (as well as their associated relative costs), the need for absolute excellence in the research that is conducted, in terms of topic, protocol, and investigator, and (3) Facilities - the single most important facility for life sciences research in space, an on-board, variable force centrifuge. In this first assessment report, the Committee on Space Biology and Medicine emphasizes that these long-standing themes remain as essential today as when first articulated. On the brink of the twenty-first century, the nation is contemplating the goal of human space exploration; consequently, the themes bear repeating. Each is a critical component of what will be necessary to successfully achieve such a goal. Author

N93-13457*# Washington Univ., Saint Louis, MO. Dept. of Earth and Planetary Sciences.

HYDROTHERMAL ORGANIC SYNTHESIS EXPERIMENTS

EVERETT L. SHOCK 1992 12 p

(Contract NAGW-2818; NSF EAR-90-18468)

(NASA-CR-191257; NAS 1.26:191257) Avail: CASI HC A03/MF A01

The serious scientific debate about spontaneous generation which raged for centuries reached a climax in the nineteenth century with the work of Spallanzani, Schwann, Tyndall, and Pasteur. These investigators demonstrated that spontaneous generation from dead organic matter does not occur. Although no aspects of these experiments addressed the issue of whether organic compounds could be synthesized abiotically, the impact of the experiments was great enough to cause many investigators to assume that life and its organic compounds were somehow fundamentally different than inorganic compounds. Meanwhile, other nineteenth-century investigators were showing that organic compounds could indeed be synthesized from inorganic compounds. In 1828 Friedrich Wohler synthesized urea in an attempt to form ammonium cyanate by heating a solution containing ammonia and cyanic acid. This experiment is generally recognized to be the first to bridge the artificial gap between organic and inorganic chemistry, but it also showed the usefulness of heat in organic synthesis. Not only does an increase in temperature enhance the rate of urea synthesis, but Walker and Hambly showed that equilibrium between urea and ammonium cyanate was attainable and reversible at 100 C. Wohler's synthesis of urea, and subsequent syntheses of organic compounds from inorganic compounds over the next several decades dealt serious blows to the 'vital force' concept which held that: (1) organic compounds owe their formation to the action of a special force in living organisms; and (2) forces which determine the behavior of inorganic compounds play no part in living systems. Nevertheless, such progress was overshadowed by Pasteur's refutation of spontaneous generation which nearly extinguished experimental investigations into the origins of life for several decades. Vitalism was dealt a deadly blow in the 1950's with Miller's famous spark-discharge experiments which were undertaken in the framework of the Oparin and Haldane hypotheses concerning the origin of life. These hypotheses were constructed on some basic assumptions which included a reduced atmosphere, and a low surface temperature for the early Earth. These ideas meshed well with the prevailing hypothesis of the 1940's and 50's that the Earth had formed through heterogeneous accretion of dust from a condensing solar nebula. Miller's experiments were extremely successful, and were followed by numerous other experiments by various investigators who employed a wide variety of energy sources for abiotic synthesis including spark discharges, ultra-violet radiation, heat, shock waves, plasmas, gamma rays, and other forms of energy. The conclusion reached from this body of work is that energy inputs can drive organic synthesis from a variety of inorganic starting materials. Author

N93-13503# Southwest Research Inst., San Antonio, TX.

INVESTIGATION OF EFFECTS OF 60-HZ ELECTRIC AND MAGNETIC FIELDS ON OPERANT AND SOCIAL BEHAVIOR AND ON THE NEUROENDOCRINE SYSTEM OF NONHUMAN PRIMATES, PART 2

J. W. RHODES 14 Jul. 1992 233 p

(Contract DE-AC02-80RA-50219)

(DE92-040153; DOE/RA-50219/21-PT-2) Avail: CASI HC A11/MF A03

This volume contains detailed experimental data to accompany quarterly report, dated July 14, 1992, by this group entitled 'Investigation of Effects of 60-Hz Electric Fields on Operant and Social Behavior and on the Neuroendocrine System of Nonhuman Primates.' This volume is a collection of Appendices which are entitled: Appendix A- Field Mapping Data Forms, Appendix B- Exposure Area (East Side) Electric Field Data, Appendix C- Exposure Area (East Side) Magnetic Field Data, Appendix D- Sham Area (West Side) Magnetic Field Data, Appendix E- Memoranda Concerning Field Onset During Experiment 4 and the Crossover Experiment, Appendix F- Exposure Area (East Side) Electric Field Data, Appendix G- Exposure Area (East Side) Magnetic Field Data, Appendix H- Sham Area (west Side) Magnetic Field Data, Appendix 1- Compiled Data and Anovas for Experiment 3 Social Data, Appendix J -Written Comments Provided by Statistician Dr. Robert Mason, and Appendix K- Reference Text Provided by Dr. Coelho. DOE

N93-13520# Southwest Research Inst., San Antonio, TX.

INVESTIGATION OF EFFECTS OF 60-HZ ELECTRIC AND MAGNETIC FIELDS ON OPERANT AND SOCIAL BEHAVIOR AND ON THE NEUROENDOCRINE SYSTEM OF NONHUMAN PRIMATES, PART 1

J. W. RHODES 14 Jul. 1992 169 p

(Contract DE-AC02-80RA-50219)

(DE92-040152; DOE/RA-50219/21-PT-1) Avail: CASI HC A08/MF A02

The objective of this program is to investigate behavioral and neuroendocrine effects associated with exposure to 60-Hz electric and magnetic fields, using the baboon (Papio cynocephalus). Results from this program are used to estimate consequences of human exposure to the electric and magnetic fields associated with electric power transmission. Electric and magnetic field measurements for Experiment 3A (Confirmatory), Experiment 4 and Social Behavior portion of Experiment 3 are presented. The systems for the production and monitoring of the fields performed satisfactorily during Experiment 3A and during all but the last part of Experiment 4. In Experiment 3, two-way repeated analyses of variance revealed statistically significant Group (Exposed and Sham Exposed) and Period (Baseline, Exposure, and Post-Exposure) main effects. Two significant Period by Group interactions were also found. Seven of the ten behavioral categories showed a main effect of Period. Two-sample t-test comparisons of the two groups for each period indicated that performance rates in two behavioral categories (Stereotypy and Posture) were significantly lower in the Exposure Group. In general, the Exposed subjects exhibited a trend of progressively lower performance rates across the three periods. Specific accomplishments reported in this document were: measurement of electric and magnetic fields for Experiments 3A and 4, completed analysis of the Social Behavioral data from Experiment 3, and a detailed discussion of statistical methods employed on the Social Behavioral portion of Experiment 3, and hematology data were collected and recorded for Operant and Social Behavioral subjects for Experiment 4. DOE

N93-13612*# Biospherical Instruments, Inc., San Diego, CA.
NEW APPROACHES TO THE MEASUREMENT OF CHLOROPHYLL, RELATED PIGMENTS AND PRODUCTIVITY IN THE SEA Final Report, 1 Apr. 1986 - 31 May 1989
C. R. BOOTH and D. A. KEIFER (University of Southern California, Los Angeles.) Sep. 1989 200 p
(Contract NAS7-969; SBIR-08.15-1315)
(NASA-CR-190879; NAS 1.26:190879; TR-89-2) Avail: CASI HC A09/MF A03

In the 1984 SBIR Call for Proposals, NASA solicited new methods to measure primary production and chlorophyll in the ocean. Biospherical Instruments Inc. responded to this call with a proposal first to study a variety of approaches to this problem. A second phase of research was then funded to pursue instrumentation to measure the sunlight stimulated naturally occurring fluorescence of chlorophyll in marine phytoplankton. The monitoring of global productivity, global fisheries resources, application of above surface-to-underwater optical communications systems, submarine detection applications, correlation, and calibration of remote sensing systems are but some of the reasons for developing inexpensive sensors to measure chlorophyll and productivity. Normally, productivity measurements are manpower and cost intensive and, with the exception of a very few expensive multiship research experiments, provide no contemporaneous data. We feel that the patented, simple sensors that we have designed will provide a cost effective method for large scale, synoptic, optical measurements in the ocean. This document is the final project report for a NASA sponsored SBIR Phase 2 effort to develop new methods for the measurements of primary production in the ocean. This project has been successfully completed, a U.S. patent was issued covering the methodology and sensors, and the first production run of instrumentation developed under this contract has sold out and been delivered. Author

N93-13700# National Science Foundation, Washington, DC.
DIVERSITY IN BIOLOGICAL RESEARCH
1992 9 p Workshop held in Washington, DC, 11-12 Jul. 1991
(NSF-92-19) Avail: CASI HC A02/MF A01

The Workshop on Diversity in Biological Research met in Washington, D.C. on July 11 and 12, 1991. The purpose of the workshop was to provide advice to the National Science Foundation (NSF) on how the number of underrepresented minorities in science and engineering can be increased and on what can be done to optimize professional growth of current minority scientists. A summary of the workshop discussions including the issues to be addressed, the goals to be achieved, and the strategies for reaching these goals is presented. L.R.R.

N93-13863# Iowa Univ., Iowa City. Dept. of Microbiology.
MOLECULAR BIOLOGY OF ANAEROBIC AROMATIC BIODEGRADATION Final Report, 15 Jun. 1989 - 14 Jun. 1992
CAROLINE S. HARWOOD 14 Aug. 1992 4 p
(Contract DAAL03-89-K-0121)
(AD-A255213; ARO-26576.3-LS) Avail: CASI HC A01/MF A01

Aromatic acids are intermediates in the biodegradation of structurally diverse aromatic compounds, including lignin monomers and environmental pollutants, by many metabolic types of anaerobic bacteria. They are also the starting compounds for central pathways of anaerobic benzene ring reduction and fission. We have identified and developed molecular tools that can be used to manipulate and clone genes for aromatic acid degradation from the bacterium, Rhodopseudomonas palustris. These tools have enabled us to identify genes specifying two enzymes that initiate the degradation of the compounds benzoate and 4-hydroxybenzoate, and we have also cloned, sequenced, and characterized a regulatory gene required for the expression of aromatic acid degradation enzymes. GRA

N93-14532# Tennessee Univ., Knoxville.
BIOFILM ECOLOGY OF BIOLUMINESCENT BACTERIA Final Report, 1 Apr. 1991 - 30 May 1992
MARC W. MITTELMAN and DAVID C. WHITE 10 Aug. 1992 28 p
(Contract N00014-91-J-1598)
(AD-A255282) Avail: CASI HC A03/MF A01

Test systems have been developed which enable the evaluation of bacterial biofilm formation and metabolic activity under conditions simulating those of the in situ environment. A series of laminar-flow adhesion cells were constructed with provisions for on-line, nondestructive measurements of bioluminescence, fluorescence, open circuit potential, and po2 for monitoring colonization and succession as influenced by a systematic change in bulk-phase and substratum conditions. Bioluminescence and fluorescence by biofilms of the bioluminescent, marine bacterium, Vibrio harveyi were utilized as endpoints for adhesion in evaluations of antifouling (AF) ship hull coatings. Resistance to colonization of V. harveyi was noted in the order of F-121 (Navy) greater than BRA 640 (IP) greater than 15 pct. DNP. Future work will evaluate changes in cellular lipid biomarkers associated with biofilms and planktonic cultures exposed to copper contained in AF coatings and in bulk-phase chemostats, respectively. The test systems and procedures developed under ONR funding will enable studies of materials compatibility, antifouling efficacy, and biocide toxicity in diverse ecosystems. GRA

N93-14557# Stanford Univ., CA. Dept. of Civil Engineering.
ANAEROBIC MICROBIAL TRANSFORMATION OF AROMATIC HYDROCARBONS AND MIXTURES OF AROMATIC HYDROCARBONS AND HALOGENATED SOLVENTS Final Report, 30 Sep. 1988 - 31 Mar. 1992
ELIZABETH A. EDWARDS, LI-NUO LIANG, and DUNIA GRBIC-GALIC 25 Aug. 1992 169 p
(Contract AF-AFOSR-0351-88)
(AD-A255696; AFOSR-92-0875TR) Avail: CASI HC A08/MF A02

Anaerobic microbial transformation of monoaromatic hydrocarbons (MAH), chlorinated benzenes (CB), and mixtures of MAH and CB, as well as MAH and chlorinated aliphatic solvents (tetrachloroethylene -- PCE, and carbon tetrachloride --CT) was studied in laboratory microcosms derived from hydrocarbon-contaminated groundwater aquifers. Some MAH, such as toluene and o-xylene, were completely degraded to CO2 and CH4 by mixed methanogenic cultures from a creosote-contaminated aquifer. This degradation was inhibited by the addition of accessory electron acceptors (oxygen, nitrate, sulfate), indicating acclimation of the microbial community to methanogenic conditions. The addition of preferred substrates, such as acetate, propionate, methanol, fatty acids, glucose, casamino acids, pepton, yeast extract, or acetone also inhibited MAH degradation, indicating that the presence of natural organic substrates may preclude anaerobic biodegradation of MAH in situ. Cyclohexane, CT, and high concentrations of toluene and o-xylene had a toxic effect under sulfate-reducing conditions. Several MAH -toluene, all three xylene isomers, and benzene were mineralized to CO2, by microorganisms from a petroleum-contaminated, sulfidogenic aquifer. Whereas-toluene and xylenes were sequentially degraded in a mixture, benzene was degraded only if alone, or slowly transformed in a mixture with toluene. This explains previously reported recalcitrance of benzene under anaerobic conditions. GRA

N93-14648# Catholic Univ. of America, Washington, DC. Vitreous State Lab.
MECHANISMS OF MICROWAVE INDUCED DAMAGE IN BIOLOGIC MATERIALS Annual Report, 22 Sep. 1990 - 21 Sep. 1991
T. A. LITOVITZ, J. J. GREENE, D. KRAUSE, R. MEISTER, and R. K. MOHR Jan. 1992 59 p
(Contract DAMD17-86-C-6260)
(AD-A255799) Avail: CASI HC A04/MF A01

The results of research directed at several of the very fundamental issues concerning cellular effects of weak electromagnetic fields is described. Despite their importance, these issues have not been satisfactorily addressed by the scientific community. They include the following issues: (1) replication of

experimental effects; (2) how weak electromagnetic fields can affect cells that exist in an electrically noisy environment; and (3) the explanation of complex dose-response relationships. GRA

N93-15208# Florida Sea Grant Coll., Gainesville.
THE PRODUCTION AND USE OF AEROPONICALLY GROWN INOCULA OF VAM FUNGI IN THE NATIVE PLANT NURSERY
AMIEL G. JARSTFER and DAVID M. SYLVIA (Florida Univ., Gainesville.) Jun. 1992 18 p Submitted for publication
(Contract NA89AA-D-SG-053; PROJ. R/C-S-27; PROJ. IR-90-2)
(PB92-204973; SGEB-22) Avail: CASI HC A03/MF A01

Selected vesicular-arbuscular mycorrhizal (VAM) fungi have been shown to enhance the growth of numerous plants of economic importance, including native plants used for revegetation of disturbed sites such as renourished coastal beaches and strip mined lands. Major benefits for the plants are increased uptake of phosphorous and other poorly mobile nutrients and tolerance of water stress. Nonetheless, VAM fungi are not used widely in plant production systems because inoculum sources are limited and application technologies are not well developed. GRA

N93-15211# Oregon Regional Primate Research Center, Beaverton.
JOINT HVAC TRANSMISSION EMF ENVIRONMENTAL STUDY
F. STORMSHAK and J. THOMPSON May 1992 191 p Prepared in cooperation with Portland State Univ., OR; Oregon Health Sciences Univ., Portland Prepared for Bonneville Power Administration, Portland. OR
(Contract DE-BI79-90BP-04293)
(DE92-017863; DOE/BP-1792) Avail: CASI HC A09/MF A02

This document describes the rationale, procedures, and results of a carefully controlled study conducted to establish whether chronic exposure of female (ewe) Suffolk lambs to the environment of a 500-kV 60-Hz transmission line would affect various characteristics of growth, endocrine function, and reproductive development. This experiment used identical housing and management schemes for control and line-exposed ewes, thus minimizing these factors as contributors to between-group experimental error. Further, throughout the 10-month duration of this study, changes in electric and magnetic fields, audible noise, and weather conditions were monitored continuously by a computerized system. Such measurements provided the opportunity to identify any relationship between environmental factors and biological responses. Because of reports in the literature that electric and magnetic fields alter concentrations of melatonin in laboratory animals, the primary objective of this study was to ascertain whether a similar effect occurs in lambs exposed to a 500-kV a-c line in a natural setting. In addition, onset of puberty, changes in body weight, wool growth, and behavior were monitored. To determine whether the environment of a 500-kV line caused stress in the study animals, serum levels of cortisol were measured. The study was conducted at Bonneville Power Administration's Ostrander Substation near Estacada, Oregon. DOE

52

AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

A93-13774* National Aeronautics and Space Administration, Washington, DC.
POTENTIAL HEALTH RISKS FROM POSTULATED ACCIDENTS INVOLVING THE PU-238 RTG ON THE ULYSSES SOLAR EXPLORATION MISSION
MARVIN GOLDMAN (California Univ., Davis), MARK D. HOOVER (Inhalation Toxicology Research Inst., Albuquerque, NM), ROBERT C. NELSON (EG&G Idaho, Inc., Idaho Falls), WILLIAM TEMPLETON (Battelle Pacific Northwest Labs., Richland, WA), LANCE BOLLINGER (USAF, Inspection and Safety Center, Kirtland AFB, NM), and LYNN ANSPAUGH (Lawrence Livermore National Lab., Livermore, CA) *In* Space nuclear power systems; Proceedings of the 8th Symposium, Albuquerque, NM, Jan. 6-10, 1991. Pt. 1 New York American Institute of Physics 1991 p. 152-164. Previously announced in STAR as N91-19857 Research supported by DOD and NASA refs
(Contract W-7405-ENG-48)
Copyright

Potential radiation impacts from launch of the Ulysses solar exploration experiment were evaluated using eight postulated accident scenarios. Lifetime individual dose estimates rarely exceeded 1 mrem. Most of the potential health effects would come from inhalation exposures immediately after an accident, rather than from ingestion of contaminated food or water, or from inhalation of resuspended plutonium from contaminated ground. For local Florida accidents (that is, during the first minute after launch), an average source term accident was estimated to cause a total added cancer risk of up to 0.2 deaths. For accidents at later time after launch, a worldwide cancer risk of up to three cases was calculated (with a four in a million probability). Upper bound estimates were calculated to be about 10 times higher.
GRA

A93-13935
A COMPUTER MODEL TO DETERMINE THE PRIMARY CONTRIBUTORS TO RELATIVE RADIATION DOSE RECEIVED BY ASTRONAUTS
OTTO W. LAZARETH, M. DIVADEENAM, HANS LUDEWIG, and JAMES R. POWELL (Brookhaven National Lab., Upton, NY) *In* Space nuclear power systems; Proceedings of the 8th Symposium, Albuquerque, NM, Jan. 6-10, 1991. Pt. 3 New York American Institute of Physics 1991 p. 1365-1371. Previously announced in STAR as N91-13866 refs
(Contract DE-AC02-76CH-00016)
Copyright

This paper describes a computer model which was used to determine the relative radiation dose of protons of different energies. In the future, the model will be extended to calculate the dosage received by an astronaut during a specific mission to Mars, and within a spacecraft with specific materials and with a specific geometry. The framework for the calculations centered on the computer program HETC, a Monte Carlo transport code for computing the properties of high energy nucleon-meson cascades in matter. It is valid up to several hundred GeV.
Author

A93-14123 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
ALTERED BASELINE BLOOD VOLUME AND THE NOREPINEPHRINE RESPONSE TO STRESS IN HUMANS
J. VERNIKOS (NASA, Ames Research Center, Moffett Field, CA) and V. A. CONVERTINO (NASA, Kennedy Space Center, Cocoa Beach, FL) *In* Stress: Neuroendocrine and molecular approaches New York Gordon and Breach Science Publishers 1992 p. 939-952. refs
Copyright

A hypothesis is proposed that a primary physiological purpose of the neural and endocrine response to stressors is the preservation of the blood volume/blood pressure relationship. Changes in blood volume caused by an adaptation to the environmental challenge serve to modulate the neural and endocrine responsiveness to stress. Relationships between changes in vascular volume, vasoconstriction, and norepinephrine (NE) responses during acute and chronic exposure to various stressors are examined. It is noted that the hypothesis is based on numerous observations rather than definitive cause-effect experiments and further investigation is required to prove it.
O.G.

A93-14968 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
ROLE OF ATRIAL NATRIURETIC PEPTIDE IN SYSTEMIC RESPONSES TO ACUTE ISOTONIC VOLUME EXPANSION
DONALD E. WATENPAUGH, CLYDE W. YANCY, JAY C. BUCKEY, LYNDA D. LANE, ALAN R. HARGENS, and C. G. BLOMQVIST (Texas Univ., Dallas; NASA, Ames Research Center, Moffett Field, CA) Journal of Applied Physiology (ISSN 8750-7587) vol. 73, no. 4 Oct. 1992 p. 1218-1226. refs
(Contract NGT-50206; NAG9-267; NAS9-16044)
Copyright

A hypothesis is proposed that a temporal relationship exists between increases in cardiac filling pressure and plasma artrial natriuretic peptide (ANP) concentration and also between ANP elevation and vasodilation, fluid movement from plasma to interstitium, and increased urine volume (UV). To test the hypothesis, 30 ml/kg isotonic saline were infused in supine male subjects over 24 min and responses were monitored for 3 h postinfusion. Results show that at end infusion, mean arterial pressure (RAP), heart rate and plasma volume exhibited peak increases of 146, 23, and 27 percent, respectively. Mean plasma ANP and UV peaked (45 and 390 percent, respectively) at 30 min postinfusion. Most cardiovascular variables had returned toward control levels by 1 h postinfusion, and net reabsorption of extravascular fluid ensued. It is concluded that since ANP was not significantly increased until 30 min postinfusion, factors other than ANP initiate responses to intravascular fluid loading. These factors include increased vascular pressures, baroreceptor-mediated vasolidation, and hemodilution of plasma proteins. ANP is suggested to mediate, in part, the renal response to saline infusion. O.G.

A93-14969
A SECOND POSTCOOLING AFTERDROP - MORE EVIDENCE FOR A CONVECTIVE MECHANISM
GORDON G. GIESBRECHT and GERALD K. BRISTOW (Manitoba Univ., Winnipeg, Canada) Journal of Applied Physiology (ISSN 8750-7587) vol. 73, no. 4 Oct. 1992 p. 1253-1258. Research supported by Manitoba Medical College Foundation and Manitoba Health Research Council refs
Copyright

An attempt was made to show the importance of increased perfusion of cold tissue in core temperature afterdrop. Subjects of the experiment were five men who were cooled twice in water (8 C) for 52-80 min. They were then rewarmed by either shivering thermogenesis or treadmill exercise for another 40-65 min, after which they entered a warm bath (40 C). Data obtained show that the initial core temperature afterdrop was 58 percent greater during exercise than shivering. Within the first 5 min after subjects entered the warm bath the initial rate of rewarming which was established previously during shivering or exercise (about 0.07 C/min) decreased. After shivering the attenuation was 0.088 +/-0.03 C/min (P less than 0.025), and after exercise it was 0.062 +/-0.022 C (P less than 0.025). It is suggested that increased perfusion of cold tissue is one probable mechanism responsible for attenuation or reversal of the initial rewarming rate. These results can be used for treatment of hypothermia victims, even when treatment begins long after removal from cold water. O.G.

A93-14971
INFLUENCE OF GRADED DEHYDRATION ON HYPERTHERMIA AND CARDIOVASCULAR DRIFT DURING EXERCISE
SCOTT J. MONTAIN and EDWARD F. COYLE (Texas Univ., Austin) Journal of Applied Physiology (ISSN 8750-7587) vol. 73, no. 4 Oct. 1992 p. 1340-1350. Research supported by Gatorade Sports Science Inst. and Louis Spence Griffeth Fellowship refs
Copyright

The effect of different rates of dehydration, induced by ingesting different volumes of fluids during prolonged exercise on hyperthermia, heart rate, and stroke volume was determined. Besides, forearm blood flow, serum osmolality, and serum sodium concentration were measured to characterize their relationship to hyperthermia during exercise-induced dehydration. It is concluded that the magnitude of increase in core temperature and heart rate and the decline in stroke volume are graded in proportion to the the amount of dehydration accrued during exercise. O.G.

A93-14972
EFFECTS OF SIMULATED MICROGRAVITY (HDT) ON BLOOD FLUIDITY
L. LAMPE, K. WIENHOLD, G. MEYER, F. BAISCH, H. MAASS, W. HOLLMANN, and R. ROST (German Sports Univ.; DLR, Inst. fuer Flugmedizin, Cologne, Germany) Journal of Applied Physiology (ISSN 8750-7587) vol. 73, no. 4 Oct. 1992 p. 1366-1369. refs
Copyright

A hypothesis that physical inactivity and relative immobility of the crew during spaceflight affect the blood fluidity was tested. An experiment was performed on six healthy men under zero-gravity conditions, and a reduced red cell deformability was measured under head-down tilt (HDT) conditions which finally caused the so-called 'spaceflight anemia'. This effect resulted from enhanced red cell membrane fragility induced by diminished physical activity and an increase in hemoglobin concentration. Diminished plasma proteins caused the reduction of plasma viscosity. Red cell aggregation was found to be enhanced despite due to the increase in hematocrit, despite the reduction in plasma proteins. O.G.

A93-14975* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
MAGNETIC RESONANCE IMAGING AND ELECTROMYOGRAPHY AS INDEXES OF MUSCLE FUNCTION
GREGORY R. ADAMS, MARC R. DUVOISIN, and GARY A. DUDLEY (Bionetics Corp., Biomedical and Environmental Labs.; NASA, Kennedy Space Center, Cocoa Beach, FL) Journal of Applied Physiology (ISSN 8750-7587) vol. 73, no. 4 Oct. 1992 p. 1578-1583. Research supported by Holmes Regional Medical Center refs
(Contract NAS10-11624)
Copyright

A hypothesis is tested that exercise-induced magnetic resonance (MR) contrast shifts would relate to electromyography (EMG) amplitude if both measures reflect muscle use during exercise. Both magnetic resonance images (MRI) and EMG data were obtained for separate eccentric (ECC) and cocentric (CON) exercise of increasing intensity for seven subjects 30-32 yr old. CON and ECC actions caused increased integrated EMG (IEMG) and T2 values which were strongly related with relative resistance. The rate of increase and absolute value of both T2 and IEMG were found to be greater for CON than for ECC actions. For both actions IEMG and T2 were correlated. Data obtained suggest that surface IEMG accurately reflects the contractile behavior of muscle and exercise-induced increases in MRI T2 values reflect certain processes that scale with muscle use. O.G.

A93-15165
FUNCTIONAL STATE OF THE VEGETATIVE NERVOUS SYSTEM IN WOMEN UNDERGOING HIGH-ALTITUDE ADAPTATION AND READAPTATION TO 760 M ABOVE SEA LEVEL [FUNKTSIONAL'NOE SOSTOIANIE VEGETATIVNOI NERVNOI SISTEMY ZHENSHCHIN V PROTSESSE VYSOKOGORNOI ADAPTATSII I READAPTATSII K USLOVIIAM NIZKOGOR'IA]
N. A. AGADZHANIAN, I. M. LEBEDEVA, A. I. ELFIMOV, E. M. BEBINOV, and V. N. BRAZHNIKOVA (Meditsinskii Inst., Bishkek, Kyrgyzstan) Fiziologiia Cheloveka (ISSN 0131-1646) vol. 18, no. 4 July-Aug. 1992 p. 5-11. In Russian. refs
Copyright

Functional characteristics of the vegetative nervous system (VNS) (including cardiovascular system functions) in women in different phases of the ovarian-menstrual cycle (OMC), residing at 760 m above sea level, were compared to the VNS indices of the same subjects after relocation to 3200 m above sea level and, then, upon their return to the lower altitude. It was found that the

reactions of the cardiovascular system to standard load tests differed depending on the OMC phase of the subjects and on the lengths of adaptation to 3200 m and readaptation to 760 m. I.S.

A93-15166
APPLICATION OF CONTRASTING TEMPERATURES AS A METHOD OF PREADAPTING PILOTS TO THE CONDITIONS OF A HOT CLIMATE [KONTRASTNYE TEMPERATURNYE VOZDEISTVIIA KAK SPOSOB PREDVARITEL'NOI TEPLOVOI ADAPTATSII PILOTOV K USLOVIIAM ZHARKOGO KLIMATA]
V. I. KOPANEV, V. N. ISHUTIN, and V. IU. CHEPRASOV (Voenno-Meditsinskaia Akademiia, St. Petersburg, Russia)
Fiziologiia Cheloveka (ISSN 0131-1646) vol. 18, no. 4 July-Aug. 1992 p. 23-29. In Russian. refs

The effect of preliminary exposures of pilots to contrasting temperatures as a method of preadaptation to flying under high-temperature conditions was investigated. The preadaptation program included eight days of three daily exposures each, to 10 min at 90 C temperature, with each exposure followed by a cool (15-17 C) shower. Results of vestibular, orthostatic, and hypoxic tests demonstrated the efficiency of the proposed scheme in improving the pilots' endurance under hot-temperature conditions. The scheme is recommended for pilots preparing to fly from moderate-climate areas to hot-climate regions. I.S.

A93-15167
REACTION CHARACTERISTICS OF SEVERAL NEUROREGULATING SYSTEMS OF COSMONAUTS AFTER A 366-DAY-LONG SPACE FLIGHT [OSOBENNOSTI REAGIROVANIIA NEKOTORYKH SISTEM NEIROREGULIATSII KOSMONAVTOV POSLE 366-SUTOCHNOGO KOSMICHESKOGO POLETA]
N. A. DAVYDOVA (Inst. Mediko-Biologicheskikh Problem, Moscow, Russia)
Fiziologiia Cheloveka (ISSN 0131-1646) vol. 18, no. 4 July-Aug. 1992 p. 30-38. In Russian. refs

The effect of a 366-day-long space flight on the activity of the sympathoadrenal, choline, serotonin, and histaminergic systems of two cosmonauts was investigated using data on concentrations of hormones (and other characteristic indices of these systems) in the subjects' blood and urine before and after the flight. Results obtained on the first day after landing indicated significant increases in the hormonal activities of adrenaline, noradrenaline, serotonin, histamine, and, to a lesser degree, products of the cholinergic system. No normalization was observed after six days of readaptation to 1-g conditions. Individual variations in the hormonal changes observed for two subjects were considerable. I.S.

A93-15168
CONTRACTILE PROPERTIES OF THE CALF TRICEPS MUSCLE IN HUMANS EXPOSED TO SIMULATED WEIGHTLESSNESS [SOKRATITEL'NYE SVOISTVA TREKHGLAVOI MYSHTSY GOLENI U CHELOVEKA V USLOVIIAKH MODELI, IMITIRUIUSHCHEI NEVESOMOST']
IU. A. KORIAK (TsNII Sport, Moscow, Russia)
Fiziologiia Cheloveka (ISSN 0131-1646) vol. 18, no. 4 July-Aug. 1992 p. 39-46. In Russian. refs

The effect of weightlessness simulated by 120-day-long hypokinetic/hypodynamic stress (bed rest) on the mechanical properties of the calf triceps muscle (CTM) was investigated in human subjects by comparing the morphological and neurophysiological characteristics of the CTM before and after bed rest. The results of measurements of the contractile capability of the CTM and of the rates of arbitrary and nonarbitrary contractions indicate that bed rest caused not only the atrophy of the muscle and a decrease in the muscle's potential to develop maximal force, but also a decrease in the central motor system control of voluntary activity. I.S.

A93-15172
THE QUALITY OF AN OPERATOR'S WORK ON A FLIGHT SIMULATOR UNDER CONDITIONS OF THERMAL DISCOMFORT [KACHESTVO RABOTY OPERATORA NA LETNOM TRENAZHERE V USLOVIIAKH TEPLOVOGO DISKOMFORTA]
A. N. AZHAEV, A. S. KUZ'MIN, and E. A. LUSHCHIKOV
Voenno-Meditsinskii Zhurnal (ISSN 0026-9050) no. 7 July 1992 p. 57-59. In Russian. refs

The effect of heat on pilot's work capacity was investigated in subjects operating a flight simulator in a closed chamber maintained at temperatures up to 60 C (with 10 percent relative humidity). The activities tested included the ability to maintain roll and pitch for six minutes during horizontal flight and the execution of a left turn with 20-deg roll and +25-deg pitch, while undergoing a climb followed by horizontal flight. It was found that the increase in ambient temperature was accompanied by increases in errors at all stages of the flight, with maximal errors committed when rectal temperature increased by 0.8 to 1 C (the maximum increase). It was also found that slight hypothermia (0.4-0.5 C increases in rectal temperature) had a somewhat beneficial effect on work capacity. I.S.

A93-15173
PHARMACOLOGICAL MEANS OF STIMULATING THE WORK CAPACITY OF FLIGHT PERSONNEL ENGAGED IN STRESSFUL ACTIVITY [FARMAKOLOGICHESKIE SREDSTVA STIMULIATSII RABOTOSPOSOBNOSTI LETNOGO SOSTAVA PRI NAPRIAZHENNOI DEIATEL'NOSTI]
P. V. VASIL'EV, G. D. GLOD, and S. I. SYTNIK
Voenno-Meditsinskii Zhurnal (ISSN 0026-9050) no. 8 Aug. 1992 p. 45-47. In Russian. refs

Problems involved in maintaining the work capacity of flight personnel with various chemical categories of stimulants are discussed. On the basis of a review of literature on the effects of stimulants during flight and during simulated flights on different aircraft types and under various stressful conditions, a number of stimulants were selected which are recommended for helping to maintain the high work capacity of pilots. I.S.

A93-15174
SUBJECTIVE REACTIONS AND OBJECTIVE ASSESSMENT OF THE AUDITORY AND VENTILATORY FUNCTIONS OF THE MIDDLE EAR DURING CHANGES IN ATMOSPHERIC PRESSURE [SUB'EKTIVNYE REAKTSII I OB'EKTIVNAIA OTSENKA SLUKHOVOI I VENTILIATSIONNOI FUNKTSII SREDNEGO UKHA PRI IZMENENIIAKH ATMOSFERNOGO DAVLENIIA]
E. V. LAPAEV and G. I. TARASENKO
Voenno-Meditsinskii Zhurnal (ISSN 0026-9050) no. 9 Sept. 1992 p. 48-51. In Russian. refs

The effect of sharp periodic changes of atmospheric pressure during high-speed aircraft maneuvers on the auditory and ventilatory functions of the middle ear was investigated in experiments in which subjects were subjected to three consecutive changes (by up to 253 mm Hg) in atmospheric pressure, with 20-25 min long intermissions. The state of the auditory canal of the subjects was assessed by performing clinical tests of the ear-nose-and-throat system before and after the experiment. Results of 45 experiments established limits on the rate at which the pressure changes (in both the compression and decompression phases) can be tolerated by humans before the appearance of clinical symptoms. I.S.

A93-15175
PSYCHOPHYSIOLOGICAL CHARACTERISTICS OF THE ACTIVITY OF FLIGHT PERSONNEL DURING TRAINING ON VTOL AIRCRAFT [PSIKHOFIZIOLOGICHESKIE OSOBENNOSTI DEIATEL'NOSTI LETNOGO SOSTAVA PRI OSVOENII SAMOLETOV VERTIKAL'NOGO VZLETA I POSADKI]
N. I. FROLOV and A. L. IVASHCHENKO
Voenno-Meditsinskii

Zhurnal (ISSN 0026-9050) no. 9 Sept. 1992 p. 52-55. In Russian.
Copyright

The paper discusses special demands imposed on the psychological and physiological systems of pilots trained on VTOL aircraft, compared to those for pilots trained on standard aircraft. The differences are due to the different time periods spent monitoring the particular cockpit instruments in both aircraft types and the differences in the dynamics of the controlling movements. It was found that training on VTOL aircraft was accompanied by continuous lowering of the level of physiological reactions of the trainees in both the preflight and the postflight periods, with stabilization during the level flight. I.S.

A93-15528
HEMATOLOGICAL CHANGES IN SPACE MICROGRAVITY ENVIRONMENTS
TADASHI OKADA and ISAMU SUGIE (Aichi Medical Univ., Japan) Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723) vol. 29, no. 2 June 1992 p. 55-58. In Japanese. refs
Copyright

Research on cardiovascular deconditioning in space microgravity environments is examined with emphasis on the effects of long-duration space flight and with particular reference to Skylab and Salyut experiments. Hematological changes leading to anemia in astronauts are described. Weightlessness is simulated using two methods, head down tilting (HDT) and head out of water immersion (WI). Y.P.Q.

A93-15530
THE CARDIOVASCULAR SYSTEM
AKIRA MIYAMOTO (Nihon Univ., Tokyo, Japan) Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723) vol. 29, no. 2 June 1992 p. 62-64. In Japanese. refs
Copyright

Cardiovascular deconditioning changes during space flight and after return to the ground are presented. A ground simulation test is described, and the load reaction of lower body negative pressure (LBNP) is addressed. Preventive measures in connection with cardiovascular deconditioning are discussed. Y.P.Q.

A93-15575
FRACTURES OF THE VERTEBRAL COLUMN AFTER EJECTION
SILVESTRU CALIANI, MAURICA STOIAN, and LUCIAN MARINESCU (Center of Aviation Medicine, Bucharest, Romania) Aeromedical & Training Digest vol. 6, no. 4 Oct. 1992 3 p. refs
Copyright

Incidents of ejection injuries of the high performance jet fighter pilots are briefly reviewed. It is pointed out that ejection seat and parachute landing training are vital to ensure the safety and well being of the jet fighter aircrews. O.G.

A93-16074
SKIN TEMPERATURE AND HEAT FLOW OF HEAD-NECK REGION UNDER DIFFERENT AMBIENT TEMPERATURES
CHENG PANG, DINGLIANG GU, XIANZHANG WANG, XUNBING YU, and JIANMIN WU (Inst. of Space Medico-Engineering, Beijing, China) Chinese Space Science and Technology (ISSN 1000-758X) vol. 12, no. 2 April 1992 p. 53-59. In Chinese. refs

Change patterns of skin temperature and heat flow in the head-neck region under the conditions of different ambient temperature have been observed and obtained. On the basis of experimental results, suggestion for amendment is given on the data about the heat dispersal calculated from original formulas. The paper provides a physiological basis for the engineering design of cooling devices in the head-neck region of a space suit. Author

A93-16075
CHANGES OF REG DURING 4H HEAD-DOWN BED-REST
XIANYUN SHEN, QIULU XIANG, and JINGRUI MENG (Inst. of Space Medico-Engineering, Beijing, China) Chinese Space Science and Technology (ISSN 1000-758X) vol. 12, no. 2 April 1992 p. 66-71. In Chinese. refs

In order to examine the adaptive capacity of the human body for bearing weightlessness (WL), the 4 h head-down 15 deg bed-rest was used to simulate WL. The tolerance time and the changes of REG during bed-rest for 38 subjects were observed. The result is that the regular changes of REG which reflect the state of brain circulation are found during the testing and is associated with the subjects' tolerance time. The results indicated that the method of short time head-down bed-rest is an effective approach to examine the adaptive capacity of subjects for bearing WL and the REG is a valuable index. Author

A93-16151
PILOT PERFORMANCE WITH BLOOD ALCOHOL CONCENTRATIONS BELOW 0.04 PERCENT
LEONARD E. ROSS, LOUISE M. YEAZEL, and ALBERT W. CHAU (Wisconsin Univ., Madison) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 951-956. refs
(Contract PHS-AA-06093)
Copyright

The effects of a low (less than 0.04 percent) BAC on pilot performance were investigated in a series of four experiments in which pilots flew a light aircraft simulator under alcohol and placebo conditions. The mean BACs of subjects when starting and finishing the test sessions were 0.037 percent and 0.028 percent, respectively. Two of the experiments involved demanding flight tasks under instrument meteorological conditions: complicated departure, holding, and approach procedures in one case; and VOR-use intersection problems in the other. The other two experiments involved ILS approaches under turbulence, cross wind, and simulated wind shear conditions that imposed heavy control-task loads on the pilots. Significant alcohol effects were found, but only under the heaviest workload conditions. During posttest interviews 75 percent of the pilots reported physical and/or mental effects due to alcohol. Author

A93-16153* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
TIME TO DETECTION OF CIRCULATING MICROBUBBLES AS A RISK FACTOR FOR SYMPTOMS OF ALTITUDE DECOMPRESSION SICKNESS
K. V. KUMAR, DICK S. CALKINS (Krug Life Sciences, Houston, TX), JAMES M. WALIGORA (NASA, Johnson Space Center, Houston, TX), JOHN H. GILBERT, III (Krug Life Sciences, Houston, TX), and MICHAEL R. POWELL (NASA, Johnson Space Center, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 961-964. refs
Copyright

This study investigated the association between time at onset of circulating microbubbles (CMB) and symptoms of altitude decompression sickness (DCS), using Cox proportional hazard regression models. The study population consisted of 125 individuals who participated in direct ascent, simulated extravehicular activities profiles. Using individual CMB status as a time-dependent variable, we found that the hazard for symptoms increased significantly (at the end of 180 min at altitude) in the presence of CMB (Hazard Ratio = 29.59; 95 percent confidence interval (95 percent CI) = 7.66-114.27), compared to no CMB. Further examination was conducted on the subgroup of individuals who developed microbubbles during the test (n = 49), by using Cox regression. Individuals with late onset of CMB (greater than 60 min at altitude) showed a significantly reduced risk of symptoms (hazard ratio = 0.92; 95 percent CI = 0.89-0.95), compared to those with early onset (equal to or less than 60 min), while controlling for other risk factors. We conclude that time to detection of circulating microbubbles is an independent determinant of symptoms of DCS. Author

A93-16154
FAILURE OF THE STRAIGHT-LINE DCS BOUNDARY WHEN EXTRAPOLATED TO THE HYPOBARIC REALM
JOHNNY CONKIN and HUGH D. VAN LIEW (New York State Univ., Buffalo) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 965-970. refs

The lowest pressure (P2) to which a diver can ascend without developing decomposition sickness (DCS) after becoming equilibrated at some higher pressure (P1) is described by a straight line with a negative y-intercept. We tested whether extrapolation of such a line also predicts safe decompression to altitude. We substituted tissue nitrogen pressure (P1N2) calculated for a compartment with a 360-min half-time for P1 values; this allows data from hypobaric exposures to be plotted on a P2 vs. P1N2 graph, even if the subject breathes oxygen before ascent. In literature sources, we found 40 reports of human exposures in hypobaric chambers that fell in the region of a P2 vs. P1N2 plot where the extrapolation from hyperbaric data predicted that the decompression should be free of DCS. Of 4,576 exposures, 785 persons suffered decompression sickness (17 percent), indicating that extrapolation of the diver line to altitude is not valid. Over the pressure range spanned by human hypobaric exposures and hyperbaric air exposures, the best separation between no DCS and DCS on a P2 vs. P1N2 plot seems to be a curve which approximates a straight line in the hyperbaric region but bends toward the origin in the hypobaric region. Author

A93-16155
ELECTROMYOGRAPHIC ACTIVITY WHILE PERFORMING THE ANTI-G STRAINING MANEUVER DURING HIGH SUSTAINED ACCELERATION
MARK W. CORNWALL and LARRY P. KROCK (USAF, Armstrong Lab., Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 971-975. refs

The purpose of this study was to measure the muscle activity during performance of the anti-G straining maneuver (AGSM) at high sustained acceleration stress (+Gz = head-to-foot inertial loading). Ten males were exposed on three separation occasions to a rapid onset rate of 6 + Gz. Subjects wore standard USAF anti-G trousers and performed the AGSM until perceived fatigue or until achieving light loss criteria. During each exposure, surface electromyography (EMG) was recorded from the erector spinae, external oblique, bicep femoris, vastus lateralis, and lateral gastronemius muscles. The normalized RMS and mean power frequency (MPF) for each muscle were calculated and tested for significant differences with an analysis of variance procedure. The results of this study showed that mean amplitude decreased during the AGSM (35.40 percent) while MPF showed no significant change. The EMG amplitude of lower extremity muscles decreased (61.45 percent) while the amplitude of trunk muscles decreased slightly (3.45 percent). These results indicate that during the performance of the AGSM, motor unit recruitment in lower extremity muscles decrease without evidence of fatigue. Author

A93-16156
THE EFFECTS OF HYPOXIA ON AUDITORY REACTION TIME AND P300 LATENCY
BARRY FOWLER and ANN-ELISE LINDEIS (York Univ., North York, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 976-981. Research supported by Defence and Civil Inst. of Environmental Medicine refs

A predominant feature of hypoxia is that it slows information processing. Evidence is accumulating that every visual mechanisms are an important locus of this slowing. Audition is believed to be insensitive to hypoxia, implying relatively less slowing with auditory stimuli. Subjects breathed air or a low oxygen mixture (65 percent arterial oxyhemoglobin saturation) while RT (reaction time) and the EEG were collected to oddball binaural tone pips at 500 Hz, 1000 Hz, and 4000 Hz. Hypoxia slowed RT and the event-related brain potential P300 in a correlated manner and by an identical amount that was generally independent of frequency. On the assumption that P300 indexes the time to evaluate a stimulus and RT indexes this time plus the time to select and execute a response, stimulus evaluation is implicated as a major locus of slowing in this experiment. The amount of slowing was comparable to that found previously with RT and P300 to visual stimuli. It may be that audition is more sensitive to hypoxia than is currently believed, at least where the speed of processing is concerned. Author

A93-16157
SEASONAL EFFECTS ON HUMAN PHYSIOLOGICAL ADAPTATION FACTORS, THERMOTOLERANCE AND PLASMA FIBRONECTIN
DAVID A. DUBOSE and JAMES W. AGNEW (U.S. Army, Research Inst. of Environmental Medicine, Natick, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 982-985. refs

Plasma fibronectin (PF) influences shock survival and basal levels increase with active conditioning that improves human physiological adaptation factors (PAF) and thermotolerance (TT). To evaluate further PF's relationship with PAF and TT, the effects of passive conditioning with seasonal change (spring vs. summer) in New England on PAF, TT, basal PF level and PF level during hot-humid exercise (HHE; bicycling; 40 +/- 4 percent Vo2max; 35 C; 70 percent rh; 45 min) were examined in male subjects (28.2 +/- 1.6 years; N = 7; values are means +/- SE). The spring and summer studies were separated by 2 months. In addition, 2 months prior to the spring study, a winter basal PF pre-screening was conducted. Winter (287 +/- 36 micrograms/ml), spring (272 +/- 21 micrograms/ml), and summer (278 +/- 19 micrograms/ml) basal PF levels were similar. The PF response during HHE was unremarkable with seasonal change. PAF were improved, since blood volume (6266 +/- 276 vs. 5895 +/- 251 ml), plasma volume (3896 +/- 198 vs. 3601 +/- 165 ml) and HHE sweat rate (18.7 +/- 5.5 vs 12.9 +/- 6.4 ml/min) were elevated (p less than 0.05) in the summer compared to the spring. However, this was not accompanied by improved TT, since spring and summer rectal temperatures during HHE were similar, while summer heart rate was elevated (p micrograms 0.05) compared to the spring. In contrast to active conditioning, passively-induced improvements in PAF were not associated with elevations in TT or PF level. Unlike PAF, PF elevations might only occur when the conditioning resulted in increased TT, which suggests a potential for PF as a TT marker. Author

A93-16158 National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
BETA-ENDORPHIN AND ARGININE VASOPRESSIN FOLLOWING STRESSFUL SENSORY STIMULI IN MAN
RANDALL L. KOHL (NASA, Johnson Space Center, Houston; Texas Univ., Galveston) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 986-993. refs
(Contract NAS9-17267; RTOP 199-16-11-08)

This experimentation partially defines, for the first time, the response of beta-endorphin (ENDO) in man during tests designed to elicit nausea and motion sickness. These responses are similar to those associated with arginine vasopressin (AVP) and adreno-corticotropin (ACTH) to the extent that all hormones rise in response to motion sickness (p less than 0.003). Repeated exposure diminished motion-induced release of ENDO (p less than 0.005) and AVP (p less than 0.004) despite a three-fold increase in resistance to motion stimuli. Higher post-stress levels of AVP (p less than 0.04) and ACTH (p less than 0.02) were correlated with greater resistance to motion sickness. These data support the hypothesis that release of AVP is a significant link between stressful motion and motion-induced nausea and other autonomic system changes. Further, resistant individual apparently can tolerate

higher peripheral levels of AVP before nausea results. Peripheral release of ENDO and ACTH may follow release of AVP; however, given the extensive and complex functional interactions that exist between AVP and the opiate systems, it is not yet possible to define a clear role for ENDO in the etiology of motion sickness. Author

A93-16160* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
EFFECTS OF ACUTE EXERCISE ON ATTENUATED VAGAL BAROREFLEX FUNCTION DURING BED REST
VICTOR A. CONVERTINO, DONALD F. DOERR (NASA, Kennedy Space Center, Cocoa Beach, FL), ANTONIO GUELL, and J.-F. MARINI (Inst. de Medecine et de Physiologie Spatiales, Toulouse, France) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 999-1003. refs
Copyright

We measured carotid baroreceptor-cardiac reflex responses in six healthy men, 24 h before and 24 h after a bout of leg exercise during 6 deg head-down bed rest to determine if depressed vagal baroreflex function associated with exposure to microgravity environments could be reversed by a single exposure to acute intense exercise. Baroreflex responses were measured before bed rest and on day 7 of bed rest. An exercise bout consisting of dynamic and isometric actions of the quadriceps at graded speeds and resistances was performed on day 8 of bed rest and measurements of baroreflex response were repeated 24 h later. Vagally-mediated cardiac responses were provoked with ramped neck pressure-suction sequences comprising pressure elevations to +40 mm Hg, followed by serial, R-wave triggered 15 mm Hg reductions, to -65 mm Hg. Baroreceptor stimulus-cardiac response relationships were derived by plotting each R-R interval as a function of systolic pressure less the neck chamber pressure applied during the interval. Compared with pre-bed rest baseline measurements, 7 d of bed rest decreased the gain (maximum slope) of the baroreflex stimulus-response relationship by 16.8 +/- 3.4 percent (p less than 0.05). On day 9 of bed rest, 24 h after exercise, the maximum slope of the baroreflex stimulus-response relationship was increased (p less than 0.05) by 10.7 +/- 3.7 percent above pre-bed rest levels and 34.3 +/- 7.9 percent above bed rest day 7. Our data verify that vagally-mediated baroreflex function is depressed by exposure to simulated microgravity and demonstrate that this effect can be acutely reversed by exposure to a single bout of intense exercise. Author

A93-16161
BALANCE AND GAIT ANALYSIS AFTER 30 DAYS -6 DEG BED REST - INFLUENCE OF LOWER-BODY NEGATIVE-PRESSURE SESSIONS
PHILIPPE DUPUI, RICHARD MONTOYA, MARIE-CLAUDE COSTES-SALON, ALEXANDRA SEVERAC (Toulouse III, Univ., France), and ANTONIO GUELL (MEDES, Toulouse, France) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 1004-1010. Research supported by CNES and Fondation pour la Recherche Medicale refs
Copyright

Five volunteers took part in -6 deg heat-down bed-rest experiments for 30 d. In the first experiment, three subjects underwent several sessions of lower-body negative-pressure (LBNP) per day, with two others serving as controls. In the second, the LBNP group of the first experiment became the control and vice versa. Two experimental protocols analyzed the bed-rest-induced modifications of balance and gait and the efficiency of LBNP in counteracting these modifications. A kymographic method allowed the measurement of walking parameters. Anteroposterior and lateral sways were successively studied with both a force platform (static condition) and a rocking platform (dynamic condition). The tests were performed 2 d before the bed-rest period, and over the 1st, 3rd and 4th days of the recovery period. When the subjects were controls, bed rest decreased step length, walking velocity, and balance stability. LBNP completely counteracted the bed-rest-induced modifications of gait and static balance and of dynamic balance for the lateral sway. As LBNP was ineffective in counteracting the modifications of the anteroposterior sway, dynamic balance deficiency was independent of the beneficial effect of LBNP on the decreased orthostatic tolerance induced by -6 deg head-down bed rest. The results indicate that head-down bed rest, like spaceflight, induces certain sensorimotor changes involved in the decrease of gait and balance performance. Author

A93-16164
POTENTIAL HAZARDS OF HIGH ANTI-GZ SUIT PROTECTION
EARL H. WOOD (Mayo Medical Center, Rochester, MN) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 1024-1026. Research supported by Waters Instruments Co refs
Copyright

Although balanced positive pressure breathing increases protection by G suits and reduces fatigue during sustained high Gz exposures, it does not prevent dependent pulmonary right-to-left shunts (arterial hypoxemia) and potentially dangerous distention of nondependent alveoli. An incident of acute incapacitating mediastinal emphysema in a healthy young man during a sustained exposure to 5.5 Gx documents this possibility. This, plus neurogenic bradycardia during sustained high Gz exposures without pressure breathing, suggests that testing of full counterpressure to neck level suits at sustained greater than 9 Gz exposures may be hazardous. Fully instrumented studies of animal surrogates with comparable thoracic dimensions are indicated. Author

A93-16254
EFFECT OF HYPERGRAVITY ON ASTRONAUTS IN SPACE FLIGHT
BAOSHENG XIE Aerospace China (ISSN 1002-7742) no. 173 Sept. 1992 p. 37-39. In Chinese.

Physiological function changes and work capacity of astronauts under chest-back hypergravity condition are studied. Measures, such as choosing a proper body position and seat shape design, to reduce the effects of the dynamical factors are discussed. The astronaut respiratory adjustment and training are outlined. Y.P.Q.

A93-17428
SUPPORTING HUMAN EXPLORATION IN SPACE - BIOMEDICAL RESEARCH
HARRY C. HOLLOWAY (Uniformed Services Univ. of the Health Sciences, Bethesda, MD) *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 11-26. refs
Copyright

The utilization of biomedical research and research results in the development of countermeasures, prevention tools, survival techniques for space missions is addressed. The interaction of human physiological systems with mission demands and evolving space/planetary habitats is discussed. C.D.

A93-17430
OPERATIONAL MEDICINE ON THE LUNAR BASE
STANLEY R. MOHLER and ROBIN E. DODGE (Wright State Univ., Dayton, OH) *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 51-53.
Copyright

The basic objectives of aerospace medical support at a manned lunar base are briefly considered. The roles of telemedicine concept and of resupply in such a facility are summarized. C.D.

A93-17439
CHRONOBIOLOGY IN A MOON-BASED CHEMICAL ANALYSIS AND PHYSIOLOGIC MONITORING LABORATORY
F. HALBERG, G. CORNELISSEN, D. C. HILLMAN, C. BINGHAM, E. HALBERG, F. GUILLAUME, F. BARNWELL, J. Y. WU, Z. R. WANG, F. E. HALBERG (Minnesota Univ., Minneapolis) et al. *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 161-203. refs
Copyright

It is argued that a lunar clinical-chemical laboratory, in conjunction with physiologic monitors on the crew and a chronobiologic data analysis capability, would serve as a critical component of a telehygiene system designed to detect chronome alterations as classifiers of risk. This could prompt preventive action, with unobtrusive blood pressure and heart rate monitoring of the crew's chronomes as principal marker rhythms at the outset. Results could be compared with those of well-matched controls living under simulated lunar conditions on earth. C.D.

A93-17440
HUMAN STRESS - MEASUREMENT AND CONSEQUENCES
THOMAS P. DAVIS (Arizona Univ., Tucson) and REDFORD B. WILLIAMS, JR. (Duke Univ., Durham, NC) *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 204-207. refs
Copyright

It is briefly argued that the use of chromatography and other analytical measurement tools can be used effectively to monitor not just psychological stress, but also physiological stress in space. The Lunar-Based Chemical Analysis Laboratory should be planned so that the presence of human stress/strain can be detected at early stages so that treatment intervention can be considered. C.D.

A93-17442
CLINICAL AND DIAGNOSTIC REQUIREMENTS - BIOCHEMICAL EXPLORATION OF AMINO ACID METABOLISM, TRNA TURNOVER AND LYMPHOCYTE ACTIVATION
J. DESGRES, M. GUIGUET, M.-F. FRIGERE, G. MACK (Bourgogne Univ., Dijon, France), G. KEITH (CNRS, Strasbourg, France), K. C. KUO, and C. W. GEHRKE (Missouri-Columbia Univ., Columbia) *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 214-229. Research supported by Institut National de la Sante et de la Recherche Medicale, CNRS, and Univ. of Missouru-Columbia refs
Copyright

Recommendations for three biological efforts to be made on a manned lunar base are given. These are: (1) the exploration of amino acids involved in human life functions, (2) monitoring of urine excretion level of modified nucleosides to detect change in tRNA turnover or nucleoside modification in astronauts, and (3) immunological investigation of the lymphocyte activation mechanism and cytogenetic studies on lymphocyte chromosome damage. The types of measurements required to implement these recommendations are pointed out. C.D.

A93-17443
MOLECULAR MECHANISMS OF STRESS
D. M. DESIDERIO (Tennessee Univ., Memphis) *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 230-235. refs
Copyright

The evaluation of stress in astronauts by measuring specific neuropeptides in saliva is briefly discussed. The kinds of measurements to be taken and the timeline along which samples are to be obtained are outlined, and sample acquisition and handling are described. The role of LBCAL in this effort is addressed. C.D.

N93-12566# Los Alamos National Lab., NM.
FUNCTIONAL MRI STUDIES OF HUMAN VISION ON A CLINICAL IMAGER
J. S. GEORGE, J. D. LEWINE, C. J. AINE, D. VANHULSTEYN, C. C. WOOD, J. SANDERS, E. MACLIN, and J. W. BELLIVEAU 1992 3 p Presented at the 14th Annual International Conference on IEEE Engineering in Medicine and Biology Society, Paris (France), 29 Oct. - 1 Nov. 1992
(Contract W-7405-ENG-36)
(DE92-017448; LA-UR-92-2039; CONF-9210149-1) Avail: CASI HC A01/MF A01

During the past decade, Magnetic Resonance Imaging (MRI) has become the method of choice for imaging the anatomy of the human brain. Recently, Belliveau and colleagues have reported the use of echo planar magnetic resonance imaging (EPI) to image patterns of neural activity. Here, we report functional MR imaging in response to visual stimulation without the use of contrast agents, and without the extensive hardware modifications required for EPI. Regions of activity were observed near the expected locations of V1, V2, and possibly V3 and another active region was observed near the parietal-occipital sulcus on the superior surface of the cerebrum. These locations are consistent with sources observed in neuromagnetic studies of the human visual response. DOE

N93-12612# Federal Aviation Administration, Washington, DC. *Office of Aviation Medicine.*
THE IDENTIFICATION AND QUANTITATION OF TRIAMTERENE IN BLOOD AND URINE FROM A FATAL AIRCRAFT ACCIDENT Final Report
VICKY L. WHITE, DENNIS V. CANFIELD, and JERRY R. HORDINSKY Jul. 1992 7 p
(AD-A254550; DOT/FAA/AM-92/23) Avail: CASI HC A02/MF A01

Triamterene, a diuretic drug used in combination with other drugs for the treatment of hypertension, was found in the blood and urine of a fatal aircraft accident victim. The extraction and identification of triamterene is difficult. It exhibits poor extraction efficiency using some standard base extraction procedures and the parent drug is unsuitable for analysis using gas chromatography. In this case a thin layer chromatography solvent system and high performance liquid chromatography were used to identify and quantitate triamterene in blood and urine. Triamterene is a strong absorber in the ultraviolet region and has an unusual UV spectrum, which simplifies the identification and quantitation of this substance by High Performance Liquid Chromatography. GRA

N93-12649# Armed Forces Radiobiology Research Inst., Bethesda, MD.
AFRRI REPORTS Report, Apr. - Jul. 1992
Jul. 1992 93 p Sponsored by DNA
(AD-A254581; AFRRI-SR92-16; AFRRI-SR92-17) Avail: CASI HC A05/MF A01

This report includes the following topics: short and long courses of ofloxacin therapy of Klebsiella pneumoniae sepsis following irradiation; possible 'accelerated striatal aging' induced by 56Fe heavy-particle irradiation--implications for manned space flights; modulation of mortality by tissue trauma and sepsis in mice after radiation injury; cytokine therapy in canine and primate models of radiation-induced marrow aplasia; comparison of behavioral and radioprotective effects of WR-2721 and WR-3689; energy transfer mechanisms in DNA--relationship to energy deposition in sub-microscopic volumes; role of interleukin 6 (IL-6) in protection from lethal irradiation and in endocrine responses to IL-1 and tumor necrosis factor; effects on enhancing hemopoietic reconstitution and increasing survival following exposure to ionizing radiation; and radioprotection of hematopoietic tissues in mice by lipoic acid. GRA

N93-12751# Air Force Inst. of Tech., Wright-Patterson AFB, OH.
PHYSIOLOGICAL EFFECTS OF POSITIVE PRESSURE VENTILATION M.S. Thesis
DENNIS L. OAKES May 1992 80 p
(AD-A254809) Avail: CASI HC A05/MF A01

Respiratory insufficiency is caused by numerous physiological aberrations, some of which can be treated by mechanical ventilatory support. This paper presents the more common forms of mechanical ventilatory support with the adjuncts of PEEP and CPAP. Physiological effects of positive pressure ventilation are explained with emphasis on major organ systems. This paper concludes with a discussion of the clinical nurse specialist's role in providing care for the patient who is mechanically ventilated. GRA

N93-12756# Chemical Research and Development Center, Aberdeen Proving Ground, MD.
SILICON NEURON Final Report, Sep. 1991 - Jun. 1992
RICHARD G. VANDERBEEK Aug. 1992 27 p
(AD-A255091; CRDEC-TR-400) Avail: CASI HC A03/MF A01

Many researchers have developed neural architectures based on extremely simplified models of neurons. Recently, researchers have developed an analog electronic model of a neuron that more accurately reproduces its biological counterpart. This electronic neuron was designed to emulate the ionic currents present in biological neurons. Based on this neural model, we designed and fabricated an eight input neuron on a 2mm by 2mm 40 pin VLSI (very large scale integrated) chip. This neuron had four excitatory and four inhibitory inputs and was approximately 330 microns by 330 microns in size. In this report I describe how the neuron operates, some of the specifics of our design, our testing procedures, and the results of our tests. GRA

N93-12905# Krug Life Sciences, Inc., San Antonio, TX.
COMPLEMENT PROTEINS AND DECOMPRESSION SICKNESS SUSCEPTIBILITY Final Report, Feb. 1990 - Feb. 1992
JAMES T. WEBB Jul. 1992 13 p
(Contract F33615-89-C-0603)
(AD-A254448; AL-TR-1992-0068) Avail: CASI HC A03/MF A01

Researcher's reports have indicated that decompression sickness (DCS) is mediated via activation of the complement system as a result of venous gas emboli (VGE) introduced during the ascent phase of a dive. Activation of complement leads to inflammation which can result in symptons similar to those of DCS. If the VGE-complement relationship theorized by researchers could be validated, tests for complement activation could predict susceptibility to DCS. GRA

N93-12945# Jefferson Medical Coll., Philadelphia, PA. Dept. of Medicine.
A CORE FACILITY FOR THE STUDY OF NEUROTOXINS OF BIOLOGICAL ORIGIN Final Report, 15 May 1986 - 15 Aug. 1991
LANCE L. SIMPSON 15 Feb. 1992 185 p
(Contract DAMD17-86-C-6161; DA PROJ. 3M1-61102-BS-12)
(AD-A254359) Avail: CASI HC A09/MF A02

Studies have been done on the variety of toxins that affect the nervous system. The toxins of major interest have been dendrotoxin, tetrotoxin, saxitoxin, botulinum neurotoxin, tetanus toxin and crotoxin. Experiments have been conducted mainly on three types of tissue preparations: (1) brain synaptosomes; (2) phrenic nerve-hemidiaphragm; and (3) cells grown in tissue culture, including neuroblastoma cells and adrenal medullary tumor cells. The major accomplishments have been: (1) isolation of homogeneous preparations of dendrotoxin; (2) partial characterization of dendrotoxin binding sites; (3) partial characterization of tetrotoxin and saxitoxin binding properties using channels inserted into lipid membranes; (4) further characterization of the intracellular actions of clostridial toxins; (5) development of binding assays for clostridial toxins; and (6) study of structure-function relationships in clostridial neurotoxins and snake neurotoxins. GRA

N93-13023*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
KATZ MODEL PREDICTION OF CAENORHABDITIS ELEGANS MUTAGENESIS ON STS-42
FRANCIS A. CUCINOTTA, JOHN W. WILSON, ROBERT KATZ (Nebraska Univ., Lincoln.), and GAUTAM D. BADHWAR (National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.) Nov. 1992 10 p
(Contract RTOP 199-04-16-11)
(NASA-TM-4383; L-17090; NAS 1.15:4383) Avail: CASI HC A02/MF A01

Response parameters that describe the production of recessive lethal mutations in C. elegans from ionizing radiation are obtained with the Katz track structure model. The authors used models of the space radiation environment and radiation transport to predict and discuss mutation rates for C. elegans on the IML-1 experiment aboard STS-42. Author

N93-13061*# Arkansas Univ., Pine Bluff.
THE NEUROCHEMICAL AND NEUROPHARMACOLOGICAL BASIS OF MOTION SICKNESS Final Technical Report, 15 Dec. 1988 - 31 Aug. 1990
C. A. WALKER 31 Aug. 1990 12 p
(Contract NAG2-427)
(NASA-CR-190957; NAS 1.26:190957) Avail: CASI HC A03/MF A01

An apparatus suitable for producing motion sickness in laboratory animals and constructed at the university is herein described. The apparatus is a modified version of that previously described by Fox and Daunton. It consists of a 66-inch steel arm anchored at the center to a wooden platform and attached to a motor that makes the arm move in a see-saw fashion. At each end of the steel arm is mounted an aluminum disc that can be rotated by a motorized device. Detachable cages are mounted on each disc for animal holding. The animal can then be exposed to rotational motion by rotation of the aluminum disc, or to see-saw motion simultaneously (Cross-coupled). The apparatus is presently being used in our laboratory to study the neuropharmacological basis of motion sickness in the rat. The device can be adapted for use with other animal species by modifying the cage mounted on the aluminum discs. Author

N93-13116# Georgia State Univ., Atlanta.
NEUROCHEMICAL CONTROL OF CIRCADIAN RHYTHMS Final Report, 1 Apr. 1986 - 31 Oct. 1991
H. E. ALBERS 2 Sep. 1992 10 p
(Contract N00014-89-J-1640; DA PROJ. RR0-4108)
(AD-A255054) Avail: CASI HC A02/MF A01

The central aim of this grant was to identify which of the various neurotransmitters found within the suprachiasmatic nucleus (SCN) are involved in synchronizing circadian rhythms with the day-night cycle. Our approach was to determine which SCN neurotransmitters are both influenced by light and capable of shifting the phase of circadian rhythms. We have investigated the possible role of a number of neurotransmitters in circadian control (e.g. vasopressin, GABA, neuropeptide Y). However, our primary focus has been on the circadian functions of vasoactive intestinal peptide (VIP), peptide histidine isoleucine (PHI), and gastrin releasing peptide (GRP). As a result of our work on VIP, PHI, and GRP, we have developed a working hypothesis of the neurochemical mechanisms underlying the synchronization of circadian rhythms with the day-night cycle. The hypothesis, called the ratio hypothesis, states that light communicated to the SCN via afferent pathways sets the ratio of VIP/PHI to GRP available for release from SCN neurons by altering the cellular levels of VIP/PHI mRNA and/or GRP mRNA, and that the ratio of VIP/PHI to GRP released from SCN neurons in response to light determines how the circadian clock is reset by light. GRA

N93-13252# Rice Univ., Houston, TX. Dept. of Electrical and Computer Engineering.
SIMULATION OF EXCITATORY/INHIBITORY INTERACTIONS IN SINGLE AUDITORY NEURONS Progress Report, 1 Apr. - 30 Sep. 1992
DON H. JOHNSON 30 Sep. 1992 1 p
(Contract N00014-92-J-1558)
(AD-A253614) Avail: CASI HC A02/MF A01

Characterization of the function of single neurons has become essential for developing advanced nodes for massively parallel computational structures. The lateral superior olive (LSO) is a nucleus located early in the ascending auditory pathway. Anatomically, each LSO neuron receives input from both ears; this fact led researchers to hypothesize that the LSO is involved in binaural hearing. Recordings from this nucleus not only confirm that LSO neurons are responsive to sounds presented in either ear, but in a particularly interesting and simple way: sounds presented in one ear excite an LSO neuron (increase its discharge

rate) while sounds present at the other ear inhibit the neuron (discharge rate decreases). This mode of operation-the interaction of excitatory an inhibitory inputs to produce neural output-is the fundamental mode of neural processing. Thus, modeling LSO neurons represents a particularly clear-cut opportunity to understand basic neural processing. The approach taken in this research is to create anatomical and biophysical models of single LSO neurons and demand that the discharge patterns produced statistically match single-neuron recordings. With this strategy, this project seeks to (1) understand the neural mechanisms that underly basic LSO response patterns (transient chopping response to tone bursts and serial interspike interval correlations), (2) understand the transformation of fractal inputs by the LSO neuron, and (3) characterize excitatory/inhibitory interactions. GRA

N93-13449*# Colorado State Univ., Fort Collins. Dept. of Physiology.
EFFECTS OF SPACEFLIGHT ON THE PROLIFERATION OF JEJUNAL MUCOSAL CELLS Final Report, 1 Nov. 1989 - 30 Apr. 1991
ROBERT W. PHILLIPS, C. L. MOELLER, HEYWOOD R. SAWYER, and K. L. SMIRNOV (Institute of Biomedical Problems, Moscow, USSR) 30 Apr. 1991 15 p
(Contract NAG2-610; PROJ. K7-17)
(NASA-CR-191303; NAS 1.26:191303) Avail: CASI HC A03/MF A01

The purpose of this project was to test the hypothesis that the generalized, whole body decrease in synthetic activity due to microgravity conditions encountered during spaceflight would be demonstrable in cells and tissues characterized by a rapid rate of turnover. Jejunal mucosal cells were chosen as a model since these cells are among the most rapidly proliferating in the body. Accordingly, the percentage of mitotic cells present in the crypts of Lieberkuhn in each of 5 rats flown on the COSMOS 2044 mission were compared to the percentage of mitotic cells present in the crypts in rats included in each of 3 ground control groups (i.e., vivarium, synchronous and caudal-elevated). No significant difference (p greater than .05) was detected in mitotic indices between the flight and vivarium group. Although the ability of jejunal mucosal cells to divide by mitosis was not impaired in flight group, there was, however, a reduction in the length of villi and depth of crypts. The concommitant reduction in villus length and crypth depth in the flight group probably reflects changes in connective tissue components within the core of villi. Author

N93-13522# Los Alamos National Lab., NM.
A WEIGHTED ITERATIVE ALGORITHM FOR NEUROMAGNETIC IMAGING
I. GORODNITSKY, J. S. GEORGE, H. A. SCHLITT, and P. S. LEWIS 1992 6 p Presented at the 14th Annual International IEEE in Medicine and Biology Society, Lyon, France, 2-4 Nov. 1992
(Contract W-7405-ENG-36)
(DE92-040244; LA-UR-92-2698; CONF-921197-1) Avail: CASI HC A02/MF A01

The goal of neuromagnetic source reconstruction is high resolution 3-D mapping of the current distribution within the brain. However, the neuromagnetic inverse problem is ill-posed and typically underdetermined. The Moore-Penrose pseudoinverse provides a linear algebraic inverse calculation that simultaneously minimizes chisquare and the Euclidean norm of the component currents. Such 'minimum norm' reconstructions tend to produce diffuse and superficial current distributions because voxels nearer the sensor array can account for more power in the data with less current than deeper voxels. We describe an algorithm that overcomes the bias of minimum norm procedures toward superficial solutions by using weights chosen to compensate for the distance dependence of magnetic signal strength. We also apply a Bayesian weighting strategy in an iterative pseudoinverse computation, to address the bias of the linear estimator procedure toward diffuse solutions. This strategy produces a progressively more focal current distribution while accommodating distributed current sources, and appears to effectively reduce the problems associated with the under-determined linear system. DOE

N93-13941# Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.
PROCEDURES FOR THE DIAGNOSTIC DOSE RESISTANCE TEST KITS FOR MOSQUITOES, BODY LICE, AND BEETLE PESTS OF STORED PRODUCTS
BRIAN ZEICHNER 1 Aug. 1992 38 p
(AD-A255224; USAEHA-TG-189) Avail: CASI HC A03/MF A01

In military operations, the control of medically important insect pests (such a mosquitoes, body lice, and beetle pests of stored products) is essential in preventing disease and the loss of food. The use of effective insecticides will maximize the control success. Public health insect pests' resistance to insecticides has been documented from around the world. The possibility of resistance affecting control should be considered before any disease vector control operation. This technical guide assists entomologists and preventive medicine specialists working under the supervision of an entomologist in using the diagnostic dose resistance test kits for several medically important insect pests. GRA

N93-14002*# Vanderbilt Univ., Nashville, TN. Dept. of Mechanical Engineering.
BONE LOSS AND HUMAN ADAPTATION TO LUNAR GRAVITY
T. S. KELLER and A. M. STRAUSS *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 569-576 Sep. 1992
Avail: CASI HC A02/MF A03

Long-duration space missions and establishment of permanently manned bases on the Moon and Mars are currently being planned. The weightless environment of space and the low-gravity environments of the Moon and Mars pose an unknown challenge to human habitability and survivability. Of particular concern in the medical research community today is the effect of less than Earth gravity on the human skeleton, since the limits, if any, of human endurance in low-gravity environments are unknown. This paper provides theoretical predictions on bone loss and skeletal adaptation to lunar and other nonterrestrial-gravity environments based upon the experimentally derived relationship, density approximately (mass x gravity)(exp 1/8). The predictions are compared to skeletal changes reported during bed rest, immobilization, certrifugation, and spaceflight. Countermeasures to reduce bone losses in fractional gravity are also discussed.
Author

N93-14027# Aerospace Medical Research Labs., Brooks AFB, TX.
THERMAL STRESS IN US AIR FORCE OPERATIONS Final Report, 1 Apr. 1990 - 31 Mar. 1992
SARAH A. NUNNELEY Aug. 1992 6 p
(AD-A255785; AL-TP-1992-0034) Avail: CASI HC A02/MF A01

Topics include issues raised by deployment to the Persian Gulf, aircrew heat stress guidance, real-time heat stress monitors, and clothing effects on human thermoregulation. A bibliography is included. GRA

N93-14028# Aerospace Medical Research Labs., Brooks AFB, TX.
PHYSIOLOGICAL STRESS FROM CHEMICAL DEFENSE CLOTHING AND EQUIPMENT Final Report, 1 Apr. 1990 - 31 Mar. 1992
SARAH A. NUNNELEY Aug. 1992 7 p
(AD-A255786; AL-TP-1992-0033) Avail: CASI HC A02/MF A01

Topics include groundcrew heat stress in Chemical Defense Ensemble (CDE), validation of the heat-humidity index for work in CDE, evaluation of CDE made with various materials, groundcrew cooling devices, and aircrew guidelines. A bibliography is included. GRA

N93-14084# Air Force Inst. of Tech., Wright-Patterson AFB, OH. Foreign Aerospace Science and Technology Center.
POSTOPERATIVE HYPERBARIC OXYGEN TREATMENT OF PERIPHERAL NERVE DAMAGE
ZHAO DEWEI and CUI ZHENJIANG 28 Aug. 1992 9 p Transl. into ENGLISH from Chung-Hua Wai Ko Tsa Chih (China), v. 29, no. 2, 1991 p 118-120
(AD-A255842; FASTC-ID(RS)T-0064-92) Avail: CASI HC A02/MF A01

This article reports on the results of 114 cases of surgical repair of peripheral nerve damage. Of these, 54 cases involving 65 nerves were given hyperbaric oxygen treatments following surgery. This article uses the other 60 cases as a control group, to explore the results of hyperbaric oxygen treatments for peripheral nerve damage. The excellent recovery rate for the hyperbaric oxygen treatment group was 89.2 percent and for the control group it was 73.2 percent (P less than 0.05). In observing the recovery of different treatment methods, the average excellent recovery rate for the hyperbaric oxygen was higher than that of the control group, and the nerve transplant group excellent recovery rate was raised even higher to 24.9 percent (P less than 0.05). In the results of the observation during the different types of recovery, in cases of emergency recovery., the two group treatment results were about the same. As time was extended, the excellent recovery rate of the hyperbaric oxygen treatment group tended to gradually increase over that of the control group. GRA

N93-14103# Army Aeromedical Research Lab., Fort Rucker, AL.
TEST AND EVALUATION REPORT OF THE PHYSIO CONTROL DEFIBRILLATOR/MONITOR, MODEL LIFEPAK(TM) 6S Final Report
JAMES E. BRUCKART, MARTIN QUATTLEBAUM, JOSEPH R. LICINA, and BILL OLDING Jul. 1992 78 p
(Contract DA PROJ. 3M4-63807-D-836)
(AD-A255691; AARL-92-27) Avail: CASI HC A05/MF A01

The Physio Control Defibrillator/Monitor, Model LifePak 6s, was tested for electromagnetic interference/compatibility in the UH-60A helicopter under the U.S. Army Program for Testing and Evaluation of Equipment for Aeromedical Operations. The tests were conducted using current military and industrial standards and procedures for electromagnetic interference/compatibility and human factors. The Physio Control Defibrillator/Monitor, Model LifePak 6s was found to be compatible with U.S. Army aeromedical aircraft. GRA

N93-14109# Educational Testing Service, Princeton, NJ.
A PSYCHOMETRICALLY SOUND COGNITIVE DIAGNOSTIC MODEL: EFFECT OF REMEDIATION AS EMPIRICAL VALIDITY Interim Report, Apr. 1989 - Aug. 1992
KIKUMI K. TATSUOKA and MAURICE M. TATSUOKA 10 Jul. 1992 65 p
(Contract N00014-90-J-1307; NR PROJ. RR0-4204)
(AD-A255926; ETS-RR-92-38-0N4) Avail: CASI HC A04/MF A01

The purpose of this study was to validate the results of cognitive diagnoses using the rule-space model and to demonstrate the usefulness of cognitive diagnoses for instruction. The results of the study strongly indicated that the rule-space model can effectively diagnose students' knowledge states and can point out ways for remediating their errors quickly with minimum effort. It was also found that the designing of instructional units for remediation can be effectively guided by the rule-space patterns, given an incidence matrix, and is based on a tree structure of cognitive attributes, knowledge, states, and items. GRA

N93-14162# Walter Reed Army Inst. of Research, Washington, DC.
WALTER REED ARMY INSTITUTE OF RESEARCH BIANNUAL REPORT Final Report, FY 1990 - FY 1991
J. D. BERMAN Jan. 1992 93 p
(AD-A255630; WRAIR-92-001) Avail: CASI HC A05/MF A01

This annual report is intended to convey WRAIR's ability to perform basic research and development in three major threat areas: biologically active substances, high energy and trauma, and stress and performance. In general, the resources of several disciplines and divisions are used to counter a threat. Each chapter describes one threat and WRAIR's response. A summary of FY 90-91 accomplishments begins each chapter. An introduction follows, which details the scientific and military significance of the threat being studied. An accomplishments section describes the recent work in detail. The organizational units that contributed to the work are then listed, followed by FY 91 personnel involved in the effort. GRA

N93-14163# Ohio Wesleyan Univ., Delaware.
ANALYSIS OF RETINAL FUNCTION FOLLOWING LASER IRRADIATION Final Report, 1 Aug. 1983 - 29 May 1992
DAVID O. ROBBINS 26 Jun. 1992 38 p
(Contract DAMD17-83-C-3172; DAMD17-88-C-8032; DA PROJ. 3M1-62787-A-878)
(AD-A255649) Avail: CASI HC A03/MF A01

Exposure of the fovea to single or multiple pulses of coherent light (532 nm) can produce both transient and permanent changes in the eye's ability to resolve fine spatial detail. The immediate effects for extended duration exposures (greater than 50 msec) are often large, producing acuity deficits as great as 90 percent of its pre-exposure level. The size of these deficits often reflect a total loss of foveal functioning although, depending upon the energy and duration of the exposure, these changes are reversible. Permanent changes in acuity can be noted in the absence of gross morphological damage and at power densities below the ED50 level provided the area of involvement is large. On the other hand, at power densities above the ED50 level, little if any permanent or consistent visual deficits are noted if the damage is restricted to relatively isolated areas within either the foveal or parafovea. Multiple pulses which increase the area of total involvement are more effective in permanently shifting postexposure acuity than are the single pulse conditions. Cumulative effects of repetitive exposures separate in time by as much as several days are possible. The exact parameters of any observed loss in visual performance is dependent upon the discrimination task and its ability to depict subtle changes in the retina mosiac. GRA

N93-14210# Hecht-Nielsen Neurocomputer Corp., Inc., San Diego, CA.
NEURAL NETWORK RETINAL MODEL REAL TIME IMPLEMENTATION Final Report, 14 Aug. 1991 - 31 Aug. 1992
ROBERT W. MEANS 2 Sep. 1992 24 p
(Contract DAAH01-91-C-R240)
(AD-A255652; REPT-3405-F-92) Avail: CASI HC A03/MF A01

The solution of complex image processing problems, both military and commercial are expected to benefit significantly from research onto biological vision systems. However, current development of biological models of vision are hampered by lack of low-cost, high-performance, computing hardware that addresses the specific needs of vision processing. The goal of this SBIR Phase 1 project has been to take a significant neural network vision application and to map it onto dedicated hardware for real time implementation. The neural network was already demonstrated using software simulation on a general purpose computer. During Phase 1, HNC took a neural network model of the retina and, using HNC's Vision Processor (ViP) prototype hardware, achieved a speedup factor of 200 over the retina algorithm executed on the Sun SPARCstation. A performance enhancement of this magnitude on a very general model demonstrates that the door is open to a new generation of vision research and applications. The model is described along with the digital hardware implementation of the algorithm using the new ViP chip set. GRA

N93-14240# Naval Health Research Center, San Diego, CA.
SLEEP INERTIA: IS THERE A WORST TIME TO WAKE UP? Interim Report, May 1989 - Sep. 1991
PAUL NAITOH, TAMSIN KELLY, and HARVEY BABKOFF 7 Jul.

1992 29 p Sponsored by Naval Medical Research and Development Command
(AD-A256602; NHRC-91-45) Avail: CASI HC A03/MF A01

Sleep inertia, a brief period of inferior task performance and/or disorientation immediately after awakening from sleep could impact on military personnel required to work soon after awakening. The objective of this study was to determine whether severity of sleep inertia showed a circadian rhythm. Subjects underwent either 64-hr without sleep or 64-hr with a 20-min nap period every 6-hr. Sleep inertia was measured by performance scores of Baddeley's logical reasoning task. The effects of sleep inertia were additive to those of sleep deprivation. Overall, effects of naps are beneficial, but naps have the side-effect of introducing a short period of performance degradation. GRA

N93-14535# Indiana Univ., Bloomington. School of Medicine.
NERVES AND TISSUE REPAIR Midterm Report, 10 Dec. 1990 - 9 May 1992
ANTHONY L. MESCHER 21 May 1992 24 p
(Contract DAMD17-91-Z-1002; DA PROJ. 3M1-62787-A-874)
(AD-A255299) Avail: CASI HC A03/MF A01

Studies have been conducted with regenerating amphibian sciatic nerves in organ culture to characterize further transport and release of transferrin in growing axons of peripheral nerves. The hypothesis under investigation is that transferrin, the iron-transport protein which is required as a permissive factor for cell growth, is delivered axonally to target cells and is involved in the nerve-dependence of cell proliferation during repair in avascular tissues lacking an adequate supply of transferrin from capillaries. Amphibian (axolotl) limb regeneration is a well-characterized model system in which the early period of growth shows complete dependence on nerves. Organ culture of sciatic nerves, combined with an assay for axolotl transferrin developed earlier, allows quantitative study of the release of this factor as well as its transport. As reported elsewhere for regenerating nerves in vivo, distal delivery of transferrin by fast axonal transport was found in cultured nerves. Moreover, transferrin was secreted and released to the medium in significant quantities at the axonal growth cones. These results have important implications for understanding the trophic effect of regenerating nerves on cell proliferation during tissue repair. GRA

N93-14556# Army Command and General Staff Coll., Fort Leavenworth, KS.
A PROGRESSIVE RESISTANCE WEIGHT TRAINING PROGRAM DESIGNED TO IMPROVE THE ARMOR CREWMAN'S STRENGTH M.S. Thesis
BRADLEY W. MAY 5 Jun. 1992 166 p
(AD-A255553) Avail: CASI HC A08/MF A02

The duties of a tank crewman are physically demanding. If a tank crewman is stronger, he will preform his job better, easier, quicker, and safer. Therefore, the focus of this thesis is the design of a weight training program to improve individual strength which will result in enhanced performance. While U.S. Army physical fitness manuals contain substantial information on weight training and principles of strength training, current doctrine does not address the specific needs of armor crewmen in the performance of their tasks. Because there is no standardized or sample weight training program, each soldier must design his own plan by selecting exercises from the manuals. The goal of my research is to bridge this gap by synthesizing this information into a prototype program. GRA

N93-14603* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 368)
Nov. 1992 93 p
(NASA-SP-7011(368); NAS 1.21:7011(368)) Avail: CASI HC A05

This bibliography lists 305 reports, articles, and other documents introduced into the NASA Scientific and Technical Information System during Sep. 1992. The subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which humans are subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Applied research receives the most emphasis, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. Author

N93-14708* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
COMPLIANT WALKER Patent
JAMES J. KERLEY, inventor (to NASA), WAYNE D. EKLUND, inventor (to NASA), and J. ALLEN CRANE, inventor (to NASA) 29 Dec. 1992 12 p Filed 3 Jul. 1991 Supersedes N91-29714 (29 - 21, p 3548)
(NASA-CASE-GSC-13348-2; US-PATENT-5,174,590; US-PATENT-APPL-SN-725111; US-PATENT-CLASS-280-1.5; US-PATENT-CLASS-280-290; US-PATENT-CLASS-280-87.051; US-PATENT-CLASS-482-69; US-PATENT-CLASS-482-68; INT-PATENT-CLASS-B62D-51/04) Avail: US Patent and Trademark Office

A compliant walker is provided for humans having limited use of their legs and lower back. It includes an upright wheel frame which at least partially surrounds an upright user wearing a partial body harness. It is attached to the frame by means of cable compliant apparatus consisting of sets of cable segments and angle bracket members connected between opposite side members of the frame and adjacent side portions of the harness. Novelty is believed to exist in the combination of a wheeled frame including a side support structure, a body harness, and compliance means connecting the body harness to the side support structure for flexibility holding and supporting a person in a substantially upright position when the user sags in the frame when taking weight off the lower extremities.
Official Gazette of the U.S. Patent and Trademark Office

N93-14731* National Aeronautics and Space Administration, Washington, DC.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 369)
Dec. 1992 77 p
(NASA-SP-7011(369); NAS 1.21:7011(369)) Avail: CASI HC A05

This bibliography lists 209 reports, articles and other documents introduced into the NASA Scientific and Technical Information System during Nov. 1992. Subject coverage includes: aerospace medicine and physiology, life support systems and man/system technology, protective clothing, exobiology and extraterrestrial life, planetary biology, and flight crew behavior and performance. Author

N93-14782# California Univ., San Diego, La Jolla. Dept. of Psychiatry.
EXTRATHALMIC MODULATION OF CORTICAL FUNCTION Annual Report, 1 Jul. 1991 - 30 Jun. 1992
STEPHEN L. FOOTE and JAIME A. PINEDA 15 Aug. 1992 8 p
(Contract AF-AFOSR-0325-90)
(AD-A255440; AFOSR-92-8841TR) Avail: CASI HC A02/MF A01

The goal of the proposed studies is to characterize the effects of noradrenergic (NA) afferents on cortical information processing. Our previous studies indicate that the primate locus coeruleus (LC) system, originating in the pontine brainstem, innervates the neocortex more densely than previously thought, exhibiting highly specific patterns in terms of the regional and laminar distribution of its axons. Our previous neurophysiological observations suggest that this system imposes state-related modulatory effects on thalamo-cortical and cortico-cortical systems. The proposed studies have the following Specific Aims: (1) to examine, in monkeys, the effects of manipulating the LC-NA system on ERPs, EEG characteristics, and associated behaviors in operant paradigms

that utilize visual or auditory cues; (2) to correlate the activities of individual monkey LC-NA neurons with cortical neuronal activity and the measures utilized in Aim 1; (3) to extend our preliminary observation that activation of the LC by local drug infusion, in halothane-anesthetized rats, produces EEG signs of cortical and hippocampal activation; and (4) to examine the relationship between the intensity of LC neuronal activity and rates of norepinephrine release in neocortex and hippocampus by performing microdialysis in these forebrain terminal regions in anesthetized rats during manipulation of LC activity. GRA

N93-14789# Naval Air Warfare Center, Warminster, PA. Air Vehicle and Crew Systems Technology Dept.
STATISTICAL ANALYSIS OF THE HUMAN STRANGULATION EXPERIMENTS: COMPARISON TO +GZ-INDUCED LOSS OF CONSCIOUSNESS Final Report, Feb. 1991 - Feb. 1992
ESTRELLE M. FORSTER and JAMES E. WHINNERY 18 Feb. 1992 31 p
(AD-A255485; NAWCADWAR-92026-60) Avail: CASI HC A03/MF A01

In 1943, Rossen, Kabat, and Anderson (RKA), published the results of their investigations involving acute arrest of the cerebral circulation in man. Their studies on the effects of brief periods of cerebral ischemia have become a classic reference in a wide variety of scientific publications including those related to acceleration induced loss of consciousness (G-LOC). An accurate quantitative kinetic comparison of the RKA data and data from G-LOC could provide information concerning the possible similarities and/or differences in the mechanisms of the two phenomena. To this end, we attempted to relate the RKA work with current G-LOC theory by re-analyzing the RKA data in such a way that quantitative comparisons could be accomplished. The induction time for RKA loss of consciousness (LOC) was 6.4 to 6.9 s and found to be similar to both the equivalent parameter in G-LOC research of 8.8 s, and the time at maximum +Gz prior to LOC of 7.3 s. The RKA time from LOC to recovery was 5.9 to 6.4 s and shorter than the equivalent G-LOC parameter of 23.7 s. However, the predicted minimum G-LOC recovery time is 6.8 s. Further, the loss of consciousness syndrome encompassing numerous psychophysiologic symptoms are essentially equivalent for both types of insults. The results seem to suggest an analogous mechanism for LOC induction and recovery caused by strangulation (RKA) and +Gz stress. GRA

N93-15006# State Univ. of New York, Stony Brook. Health Sciences Center.
TRAINING, MUSCLE FATIGUE AND STRESS FRACTURES Final Report, 28 Sep. 1990 - 29 Dec. 1991
CLINTON T. RUBIN 29 Jul. 1992 49 p
(Contract DAMD17-90-Z-0054; DA PROJ. 301-61102-BS-15)
(AD-A255277) Avail: CASI HC A03/MF A01

The objective of this twenty month contract has been to identify the causative mechanical factors responsible for the stress fracture lesion. Over this period, the research has focussed exclusively on an animal model developed specifically for this work, the functionally isolated avian ulna. The stress fracture protocols have exploited this model's ability to withstand, in vivo, high cyclic loading, applied both axially and torsionally, with the aim of identifying that specific mechanical agent within the physical regimen which stimulates this debilitating condition. Previous work from our group suggests that the lesion is a product of tissue remodeling (intracortical porosis), not material microdamage. As importantly, the site of the lesion, when correlated to the mechanical environment to which the bone is subjected, emphasizes that the pathology predominates in areas of least normal strain, not those areas subject to greatest deformation. Finally, the pathology observed in this animal model is identical to that which occurs in humans, demonstrating the appropriateness of using these studies to better understand the etiology of the human condition. From these developments, we proposed that the stress fracture lesions, or rather elevated intracortical remodeling, was not intensity dependent, but instead was a product of redundant, cyclic activity. GRA

N93-15009# London Univ. (England). Dept. of Pharmacology.
AUTORADIOGRAPHIC DISTRIBUTION AND APPLIED PHARMACOLOGICAL CHARACTERISTICS OF DEXTROMETHORPHAN AND RELATED ANTITISSUE/ANTICONVULSANT DRUGS AND NOVEL ANALOGS Annual Report, 15 Jul. 1991 - 14 Jul. 1992
NORMAN G. BOWERY 1 Aug. 1992 12 p
(Contract DAMD17-90-C-0124; DA PROJ. 3M1-61102-BS-11)
(AD-A255607) Avail: CASI HC A03/MF A01

Binding of dextromethorphan and its analogues to the dextromethorphan binding site and to the PCP and glycine binding sites associated with the N-methyl-D-aspartate receptor-channel complex was investigated using 3H-DM, H-TCP and 3H-glycine as radioligands. The experiments were carried out in 1 ml tubes (miniblocks), in a final incubation volume of 0.5 ml. All reagents were diluted and dispensed using a TECAN and filtering was done using a Brandel M-48R. Samples were counted in 5 ml of Esoscint A. after an extraction period of at least 6 hours, using a Beckman LS1701 liquid scintillation counter. All compounds were dissolved in distilled water except compound 3 which was dissolved in DMSO/lactic acid and diluted with distilled water. Standards were obtained from commercial sources except dichlorokynurenic acid (DCK) which was a gift from Pfizer Central Research, Sandwich, Kent. GRA

N93-15053# Ohio State Univ., Columbus.
DEMODULATION PROCESSES IN AUDITORY PERCEPTION Final Report, 1 Dec. 1988 - 31 May 1992
LAWRENCE L. FETH 15 Aug. 1992 191 p
(Contract AF-AFOSR-0227-89)
(AD-A255748; AFOSR-92-0837TR) Avail: CASI HC A09/MF A02

This document reports the accomplishments of a project on the application of the Envelope-Weighted Average of Instantaneous Frequency (EWAIF) model to the processing of complex, time-varying sounds. We consider the task of human listeners to be one of recovering information imposed on the sound stream by a variety of sources. These include speech, music and other environmentally-important signals. Information is encoded in amplitude (envelope) and angle (frequency or phase) modulations of the sound stream carrier. The human listener must demodulate the stream to recover the information. EWAIF first demonstrated that these modulations interact and could provide discrimination cues even for steady-state signals such as those used in profile analysis or co-modulation masking. This project revised the EWAIF model into the IWAIF version Intensity (envelope-squared) weighting leads to greater computational efficiency (via the FFT) and to an intuitively appealing representation. The IWAIF calculation leads to the center-of-gravity of the spectrum. Tracking frequency modulations imposed on a narrow bandwidth carrier, then may be thought of as tracking the spectral center of gravity. Work continues on the extension of the IWAIF model to handle processing of signals with multiple modulation sources and to refining the short-term tracking abilities of the model. GRA

N93-15192# Biotronics Technologies, Inc., Waukesha, WI.
TRANSCUTANEOUS ANALYTE MEASURING METHODS (TAMM), PHASE 2 Quarterly Progress Report No. 4
KENNETH J. SCHLAGER 12 Oct. 1992 7 p
(Contract N00014-91-C-0190)
(AD-A256327) Avail: CASI HC A02/MF A01

The major objective of this extended quarter was to complete the analysis of pre-clinical data collected at the National Naval Medical Center (NNMC) in Bethesda, Maryland for the purposes of accuracy evaluation and algorithm development so as to allow for the initiation of field instrument development. Data on the first 250 patients were collected at the Bethesda NNMC beginning on June 23, 1992 during two separate time periods. Testing was completed on August 4th. All patients were military personnel undergoing physical examinations. This patient group was selected to be representative of combat age military personnel. Meanwhile, testing of the second group of 250 patients began at Froedtert Lutheran Memorial Hospital in Milwaukee on September 9, 1992 in conjunction with the Department of Endocrinology and the

Shared Clinic of the Medical College of Wisconsin. Patients tested are people with various medical problems that were being treated on an out-patient basis. Testing will be completed on or about November 30th. GRA

N93-15198# New York Univ., New York. Dept. of Physiology and Biophysics.
BIOPHYSICAL AND BIOCHEMICAL MECHANISMS IN SYNAPTIC TRANSMITTER RELEASE Final Report, 1 Feb. 1989 - 31 Jan. 1992
RODOLFO R. LLINAS 31 Jan. 1992 71 p
(Contract AF-AFOSR-0270-89)
(AD-A256340; AFOSR-92-0901TR) Avail: CASI HC A04/MF A01

The initial question addressed in 1989 was that of synaptic vesicle movement as determined by direct microscopic visualization. This research demonstrated that vesicles were actually mobilized from the point of injection in the axon to the active zones, i.e. the place where synaptic transmitter is released. It was also found that a change in either oxygenation or the surface properties of vesicles can lead to no movement or, to change in movement direction. The second aspect of synapse work performed that year was a demonstration of the category of calcium channel that is responsible for transmitter release. The work in 1990 demonstrated that miniature potentials could be modulated in the squid synapse by injection of Synapsin 1 and of protein kinase 2. In the third year of the grant, 1991, the first demonstration of calcium microdomains in synaptic transmission was performed. GRA

N93-15249# Department of the Army, Washington, DC.
IMPROVED HEAD SUPPORT STAND ADJUSTABLE BY COMPOUNDTURNBUCKLE Patent Application
BRUCE E. AMREIN, inventor (to Army) and JEFFERY D. NICKEL, inventor (to Army) 22 Jun. 1992 18 p Filed 22 Jun. 1992
(AD-D015384; US-PATENT-APPL-SN-902166) Avail: CASI HC A03/MF A01

The invention is an improved head support stand used to smoothly and accurately position a patient's head when imaging the patient's upper spinal area. The improved stand includes a compound turnbuckle mounted between a base of the stand and a head cradle or face plate mounted to the base. The compound turnbuckle includes two rods threadingly engaged to a turnbuckle body so that the rods translate with respect to the body when it rotates. When the compound turnbuckle is in a fully retracted position, the rods are in a telescoped configuration within the turnbuckle body. When the compound turnbuckle is in a fully extended position, the rods are axially remote from each other and project substantially all the way out of the turnbuckle body. GRA

N93-15583*# George Washington Univ., Washington, DC. Science Communications Studies Dept.
PUBLICATIONS OF THE SPACE PHYSIOLOGY AND COUNTERMEASURES PROGRAM, NEUROSCIENCE DISCIPLINE: 1980-1990
KATHERINE J. DICKSON, JANICE WALLACE-ROBINSON, JANET V. POWERS, and ELIZABETH HESS NASA Dec. 1992 117 p
(Contract NASW-4324)
(NASA-CR-4476; NAS 1.26:4476) Avail: CASI HC A06/MF A02

A 10-year cumulative bibliography of publications resulting from research supported by the neuroscience discipline of the space physiology and countermeasures program of NASA's Life Sciences Division is provided. Primary subjects included in this bibliography are space motion sickness; vestibular performance, posture, and motor coordination; vestibular physiology; central and peripheral nervous system physiology; and general performance and methodologies. General physiology references are also included. Author

53

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A93-14097 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
ANISOTROPY IN AN AMBIGUOUS KINETIC DEPTH EFFECT
JEFFREY B. MULLIGAN (NASA, Ames Research Center, Moffett Field, CA) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232) vol. 9, no. 4 April 1992 p. 521-529. Research supported by IBM Corp. refs
(Contract NIH-EY-01711; RTOP-506-47)
Copyright

A set of animated stimuli (Lissajous figures), each element of which is physically consistent with two different 3D shapes undergoing rigid rotations about orthogonal axes is presented. Predictions of which shape will be seen are made by utilizing an adaptation of Hildreth's smoothest-velocity-field computation. Results indicate that the ambiquity in 2D visual motion, i.e., the aperture problem, is not resolved before the interpretation of the 3D structure. R.E.P.

A93-14098* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
LOCUS OF THE SINGLE-CHANNEL BOTTLENECK IN DUAL-TASK INTERFERENCE
ROBERT S. MCCANN (Sterling Federal Systems, Inc., Palo Alto, CA) and JAMES C. JOHNSTON (NASA, Ames Research Center, Moffett Field, CA) Journal of Experimental Psychology: Human Perception and Performance (ISSN 0096-1523) vol. 18, no. 2 1992 p. 471-484. Research supported by National Research Council refs
(Contract NCA2-225)
Copyright

Two experiments used the locus-of-cognitive-slack method to determine whether dual-task interference occurs before or after the response selection stage. The experiments used the overlapping tasks paradigm, in which two signals, each requiring a different speeded choice response, are presented in rapid succession. In Experiment 1, stimulus-response (S-R) compatibility was manipulated by varying whether Task 2 stimuli were mapped onto their responses by a rule or arbitrarily. Compatibility effects were additive with the effects of degree of task overlap, manipulated by varying the stimulus onset asynchrony between the signals. Experiment 2 examined 2 additional forms of S-R compatibility: symbolic compatability (arrows vs. letters) and spatial compatibility (the 'Simon' effect). Effects of symbolic compatibility were additive with effects of degree of task overlap, whereas the effects of spatial compatibility and degree of task overlap were underadditive. It is argued that only a central-bottleneck model provides a consistent account of these results. The nature of the central bottleneck is considered. Author

A93-14119 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
HUMAN SPEED PERCEPTION IS CONTRAST DEPENDENT
LELAND S. STONE (NASA, Ames Research Center, Moffett Field, CA) and PETER THOMPSON (York Univ., United Kingdom) Vision Research (ISSN 0042-6989) vol. 32, no. 8 1992 p. 1535-1549. Research supported by National Research Council refs
(Contract RTOP 199-16-12-37; RTOP 506-71-51)
Copyright

When two parallel gratings moving at the same speed are presented simultaneously, the lower-contrast grating appears slower. This misperception is evident across a wide range of contrasts (2.5-50 percent) and does not appear to saturate. On average, a 70 percent contrast grating must be slowed by 35

percent to match a 10 percent contrast grating moving at 2 deg/sec (N = 6). Furthermore, the effect is largely independent of the absolute contrast level and is a quasilinear function of log contrast ratio. A preliminary parametric study shows that, although spatial frequency has little effect, relative orientation is important. Finally, the misperception of relative speed appears lessened when the stimuli to be matched are presented sequentially. Author

A93-15529
CONTRIBUTION OF PSYCHIATRY TO LIFE IN SPACE
TOSHINORI KITAMURA (National Inst. of Mental Health, Ichikawa, Japan), GENICHI MATSUDA, TOMOMI ISHIDSUKI, and SIGENOBU KANBA (Keio Univ., Tokyo, Japan) Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723) vol. 29, no. 2 June 1992 p. 59-61. In Japanese. refs
Copyright

The psychiatric aspect of the space station plan with the participation of Japanese astronauts is presented. The four-step psychiatric system for the space station includes: 1) psychiatric selection of astronauts; 2) a ground-based psychiatric management and support system; 3) psychiatric support for dealing with emergency situations during the period of living on the space station; and 4) rehabilitation support after returning to the earth. Y.P.Q.

A93-15661
SHORT-TERM RETEST RELIABILITY OF AN EXPERIMENTAL U.S. AIR FORCE PILOT CANDIDATE SELECTION TEST BATTERY
THOMAS R. CARRETTA (USAF, Armstrong Lab., Brooks AFB, TX) International Journal of Aviation Psychology (ISSN 1050-8414) vol. 2, no. 3 1992 p. 161-173. refs
Copyright

Two hundred forty-seven U.S. Air Force pilot candidates commissioned through the Air Force Reserve Training Corps were tested on an experimental form of the Basic Attributes Test (BAT) battery twice on consecutive days at the beginning of a flight test screening program. The purpose of this study was to examine the short-term retest reliability of the BAT battery. There was a moderate correlation between subjects' first and second administration test composites (Pearson r = .56, Spearman rho = .55). The magnitude of the retest correlations may have been underestimated due to reduced test length and preselection of subjects on operational selection instruments. Implications for an operational retest policy and for a planned measurement and metric equivalency study are discussed. Author

A93-15662
THE 'ARTFUL' DECISION MAKER - A FRAMEWORK MODEL FOR AERONAUTICAL DECISION MAKING
DAVID O'HARE (Otago Univ., Dunedin, New Zealand) International Journal of Aviation Psychology (ISSN 1050-8414) vol. 2, no. 3 1992 p. 175-191. refs
Copyright

The important role of good decision making in aviation safety is now widely recognized. Although much effort has been devoted to the development of prescriptive models of aeronautical decision making (ADM) and the preparation of training materials, very few attempts have been made to study the actual decision-making processes of pilots. This article reviews the available literature of descriptive studies of ADM, as well as other examples of naturalistic decision making in complex, dynamic environments. The process of ADM appears to differ in significant ways from the normative approach of decision analysis. A framework model of ADM is proposed and its compatability with current artificial intelligence models of decision making is discussed. The role of this descriptive model in directing future research into ADM and as a basis for further prescriptive efforts are highlighted. Author

A93-15663
A REAPPRAISAL OF AGING AND PILOT PERFORMANCE
PAMELA S. TSANG (Wright State Univ., Dayton, OH) International Journal of Aviation Psychology (ISSN 1050-8414) vol. 2, no. 3 1992 p. 193-212. refs
(Contract NIH-AG-08589)
Copyright

The effects of aging on four cognitive functions which are considered to be critical for piloting are reviewed. These functions include perceptual processing, memory, problem solving and decision making, and psychomotor coordination. Two general theories of the central determinants of cognitive aging, cognitive slowing and resource reduction, are briefly described. O.G.

A93-15664
POSTSTRIKE AIR TRAFFIC CONTROL TRAINEES - BIODEMOGRAPHIC PREDICTORS OF SUCCESS IN SELECTION AND SCREENING
WILLIAM E. COLLINS, LENDELL G. NYE, and CAROL A. MANNING (FAA, Civil Aeromedical Inst., Oklahoma City, OK) International Journal of Aviation Psychology (ISSN 1050-8414) vol. 2, no. 3 1992 p. 213-223. refs
Copyright

A biographical questionnaire was completed by 3,578 air traffic control (ATC) students who entered the Federal Aviation Administration Academy between October 1985 and September 1987. The demographic characteristics of these more recent academy trainees (from a more stabilized poststrike selection process) were compared with two previous groups of academy entrants (one prestrike, one poststrike). The impact of biodemographic characteristics on success in ATC specialist (ATCS) training was evaluated. Also, results were obtained from the aptitude tests that were used to select the academy entrants. Pooled within-group correlations between the discriminating variables and the canonical discriminant function were calculated to determine the characteristics related to academy pass-fail status. Variables that were significantly related to academy performance included high school math grades, personal performance expectations, age, and the number of times an ATCS applicant had taken the qualifying aptitude tests. Biodemographic factors can be used to improve recruitment and selection of ATCSs. Author

A93-16152
SUCCESS RATE ANALYSIS OF NAVY SERGRAD FLIGHT TRAINING
D. A. HILAND, F. H. JENKINS, D. C. ARTHUR, and K. P. MILLER (U.S. Navy, Naval Aerospace Medical Inst., Pensacola, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 957-960. refs
Copyright

SERGRADS are selectively retained graduates of Naval Flight Training who become flight instructors during their first tour as Naval Aviators. A perception exists that SERGRADS have more difficulties than newly designated pilots during subsequent training in the Fleet Replacement Squadrons (FRS). A preliminary inquiry at the F/A-18 FRS revealed that former SERGRADS appear to experience a higher rate of failure on their initial carrier qualification attempt during FRS training. This study examined the SERGRAD experience and compared their performance to trainees from other sources. Although significant differences were found between groups for Fleet Replacement Squadron flight grades and Training Command composite grades, no significant differences were found between the groups for Training Command carrier qualification grades or Fleet Replacement Squadron carrier qualification. Thus, the data do not support the hypothesis that SERGRADS have more problems or are poorer aviators than F/A-18 students from other sources. Author

A93-16159
ACCURACY OF AIMED ARM MOVEMENTS IN CHANGED GRAVITY
OTMAR BOCK, IAN P. HOWARD (Inst. for Space and Terrestrial Science, North York, Canada), KENNETH E. MONEY (Defence and Civil Inst. of Environmental Medicine, North York, Canada), and KARIN E. ARNOLD (Inst. for Space and Terrestrial Science, North York, Canada) Aviation, Space, and Environmental Medicine

(ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 994-998. Research supported by NSERC and National Research Council of Canada refs

We studied the accuracy of aimed arm movements in normal gravity, and during the hypergravity (hyper-G) and microgravity (micro-G) episodes of KC-135 parabolic flights. Subjects pointed at mirror-viewed targets without sight of their arm, and final pointing position was measured by a digitizing pad. Compared with the normal gravity (normal-G) baseline, subjects pointed consistently higher in hyper-G, and still higher in micro-G. Results were not different if subjects viewed targets only during normal-G and pointed at their memorized position under changed gravity (changed-G); this suggests that the 'elevator illusion' played a minor role in our study. The observed impairments were attributed to degraded proprioceptive feedback and/or inappropriate motor programs in changed-G. Pointing accuracy improved movement-to-movement but not parabola-to-parabola, indicating that prolonged exposure is needed for sustained adaptation. Author

A93-16162
PSYCHIATRIC DIAGNOSES ABOARD AN AIRCRAFT CARRIER
BRUCE BOHNKER, GARY MCEWEN, JOSE BLANCO, and EDMOND FEEKS (U.S. Navy, Washington) Aviation, Space, and Environmental Medicine (ISSN 0095-6562) vol. 63, no. 11 Nov. 1992 p. 1015-1018. refs

A descriptive study was conducted for 150 consecutive patients with a psychiatric diagnosis evaluated over 11 months by the medical staff onboard an aircraft carrier. Patients with sole diagnosis of alcohol abuse or dependence were excluded. Axis II diagnoses, or personality disorders, were more common (N = 120) than Axis I diagnoses (N = 46). The most common Axis I diagnoses were adjustment disorder and major depression. Axis II diagnoses were significantly more likely (OR = 7.33, 95 percent CI 4.45-12.16, p = 0.000) in sailors less than 23 years of age compared to ship's population. Suicide behavior was demonstrated in 68 percent (102/150) of the patient population. This study emphasized the requirement for extensive psychiatric training for the clinical aerospace medicine specialists providing operational support to aircraft carrier crews. Author

A93-16373
PREDICTABLE EYE-HEAD COORDINATION DURING DRIVING
MICHAEL F. LAND (Sussex Univ., Brighton, United Kingdom) Nature (ISSN 0028-0836) vol. 359, no. 6393 Sept. 24, 1992 p. 318-320. Research supported by SERC refs

The oculomotor behavior of car drivers is examined using a new portable and inexpensive method for recording head and eye movements. Emphasis is given to the large gaze changes made at road junctions. The results show that the pattern of eye and head movements is highly predictable given only the sequence of gaze targets. C.D.

A93-17071
A NEW GENERATION OF ASTRONAUTS IN SPACE - THE ASTRONAUT SELECTION PROCESS
A. RIPOLL and F. ROSSITTO (European Astronauts Centre, Cologne, Germany) ESA Bulletin (ISSN 0376-4265) no. 71 Aug. 1992 p. 40-46.

ESA's Council approved the setting-up of a single European Astronauts Corps in June 1989 and as a result the Agency initiated a selection campaign for European Candidate Astronauts. Considerable experience has been gained in the process of this campaign and many lessons have been learned which will be of great value for future similar selection exercises. Author

A93-17431
CREW FACTORS
H. C. HOLLOWAY (Uniformed Services Univ. of the Health Sciences, Bethesda, MD) *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 54-65. refs

Psychological and performance problems that will affect crews in long-term space flight are examined. The selection, training, and overall management of the crew as methods of maintaining high performance levels and preventing behavioral breakdown are considered. The need for a reliable method to assess performance capacity on long-term space flights is emphasized. C.D.

N93-12662# *Dayton Univ., OH. Research Inst.*
PERCEPTUAL DIMENSIONS OF VISUAL SCENES RELEVANT FOR SIMULATING LOW-ALTITUDE FLIGHT Interim Report, Jun. 1988 - Nov. 1991
JAMES A. KLEISS Jun. 1992 52 p
(Contract F33615-90-C-0005)
(AD-A254645; AL-TR-1992-0011) Avail: CASI HC A04/MF A01

Multidimensional scaling was used to identify the features of real-world terrain that are salient to pilots during low-altitude flight. The subjects were pilots experienced flying in the Southwest United States (Experiment 1) and pilots experienced flying in Europe (Experiment 2). The stimuli were videotape segments (Dynamic Presentation) and still photographs (Static Presentation) depicting low-altitude flight over a variety of real-world terrains. Pilots rated pairs of terrains with respect to similarity of visual cues for low-altitude flight. Terrains were also rated on eight bipolar rating scales representing a variety of terrain characteristics thought to be of possible relevance to pilots. Similarity ratings were submitted to a multidimensional scaling analysis using the procedure ALSCAL. Two-dimensional solutions were deemed most appropriate in all cases. Bipolar ratings were submitted to a multiple regression analysis in which ratings on each scale were regressed over dimensional coordinates. Results of Experiment 1, Dynamic Presentation, revealed dimensions corresponding to the following: (1) terrain contour; and (2) object size and spacing. Results for Static Presentation were less interpretable suggesting the possibility of a single dimension capturing the presence/absence of global scene detail. In Experiment 2, results for both presentation modes replicated Experiment 1, Dynamic Presentation, although the fit of the data remained superior with Dynamic Presentation. Taken together, these results provide consistent evidence that pilots flying at low altitudes perceive variation in terrain contour and object size and spacing. GRA

N93-14020*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
THE LUNAR COMMUNITY CHURCH: CONTRIBUTIONS TO LUNAR LIVING AND TO EVOLUTION OF ETHICAL AND SPIRITUAL THINKING
J. H. ALLTON *In its* The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 703-705 Sep. 1992
Avail: CASI HC A01/MF A03

Should religious institutions get interested in lunar settlement? Would their participation make positive contributions or would it discourage creative diversity and interfere with science and good technical judgement? Among the spacefaring nations of today, religion is distinctly separated from the governments that plan and pay for space exploration. However, as we move off the Earth, our art and philosophy will follow our science and technology. Spiritual thinking will follow as part of our culture. It is time to consider in what ways this can occur constructively. Transport of religious values to a lunar base may have positive effects in two ways. First, the social structure of a 'community church' as found in today's United States, supports its members psychologically. Mutual psychological and social support will be needed in a lunar community. Second, our space pioneers will experience a unique view of the universe which may, in their philosophical discussions, forge new ideas in the spiritual realm. Author

N93-14267# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
A SPURIOUS POP-OUT IN VISUAL SEARCH Final Report

J. THEEUWES and M. P. LUCASSEN Sep. 1992 17 p
(AD-A256548; IZF-1992-B-8; TDCK-92-2288) Avail: CASI HC A03/MF A01

The present study demonstrates that an object embedded in an array of identical objects can pop-out. Dependent on the stimuli preceding the search display, local (chromatic) adaptation causes an identical object to pop-out because it appears to have a color (Experiment 1) or brightness (Experiment 2) that is slightly different from the color and brightness of the other objects in the display. Experiment 3 shows that this pop-out even occurs when the stimulus preceding the search display is presented for 100 Ms. The present findings have severe implications on the design of experiments in which no eye movements are allowed involving multiple displays presented in successive order. GRA

N93-14416# Human Engineering Labs., Aberdeen Proving Ground, MD.
EFFECTS OF SPATIAL LUMINANCE NONUNIFORMITIES ON VISUAL-TASK PERFORMANCE AND SUBJECTIVE UNIFORMITY Final Report
J. J. GALLIMORE and W. W. FARLEY Jul. 1992 17 p
(Contract DA PROJ. 1L1-62716-AH-70)
(AD-A255989; HEL-TM-5-92) Avail: CASI HC A02/MF A01

The objectives of the experiment described in the paper were the determination of the effects of nonuniformities on operator performance and perception, and the validation of current recommended standards. Subjects performed two tasks in the presence of nonuniformities: an objective visual search task and a subjective magnitude-estimation task for the determination of perceived uniformity. The results indicated that the nonuniformities did not appreciably affect search performance, and that current recommendations are appropriate, although the magnitude-estimation task results indicated that the subjects were sensitive to the nonuniformities. The subject impressions of perceived uniformity results follow the contrast threshold function of the visual system. GRA

N93-14510# Minnesota Univ., Minneapolis. Dept. of Psychology.
PSYCHOPHYSICAL ANALYSES OF PERCEPTUAL REPRESENTATIONS Annual Report, 15 Apr. 1991 - 14 Apr. 1992
IRVING BIEDERMAN and GORDON E. LEGGE 18 Aug. 1992 12 p
(Contract AF-AFOSR-0274-90)
(AD-A255432; AFOSR-92-0834TR) Avail: CASI HC A03/MF A01

Research during the past year was divided between studies at USC (Biederman and students) and Minnesota. Our research continues to focus on linking early sensory representations to higher-level perceptual representations. Studies outlined below have examined the sensory/perceptual middle ground in object recognition, depth perception, reading, and auditory perception. Several of our studies have used ideal-observer analysis. The ideal-observer approach provides a means for quantifying the information available to perception and for evaluating the effectiveness with which humans use that information. GRA

N93-14580# Massachusetts Inst. of Tech., Lexington.
PARAMETRIC STUDY OF DIFFUSION-ENHANCEMENT NETWORKS FOR SPATIOTEMPORAL GROUPING IN REAL-TIME ARTIFICIAL VISION Annual Technical Report, Apr. 1991 - Jun. 1992
ROBERT K. CUNNINGHAM and ALLEN M. WAXMAN 24 Jul. 1992 41 p
(Contract F19628-90-C-0002)
(AD-A256059; ESC-TR-92-121) Avail: CASI HC A03/MF A01

This is the second Annual Technical Summary of the MIT Lincoln Laboratory parametric study of diffusion-enhancement networks for spatiotemporal grouping in real-time artificial vision. Spatiotemporal grouping phenomena are examined in the context of static and time-varying imagery. Dynamics that exhibit static feature grouping on multiple scales as a function of time, and long-range apparent motion between time-varying inputs, are developed for a biologically plausible diffusion-enhancement layer coupled by feedforward and feedback connections; input is provided by a separate feature-extracting layer. The model is cast as an analog circuit that is realizable in VLSI, the parameters of which are selected to satisfy a psychophysical data base on apparent motion. GRA

N93-14600# Army Aeromedical Research Lab., Fort Rucker, AL.
THE RELATIONSHIP BETWEEN COMPUTER SCORING AND SAFETY-PILOT GRADING OF FLIGHT PERFORMANCE
JOHN A. CALDWELL, HEBER D. JONES, DAVID J. CARTER, and J. L. CALDWELL Jul. 1992 44 p
(Contract DA PROJ. 3M2-63002-F-995)
(AD-A256245; AARL-92-30) Avail: CASI HC A03/MF A01

Three different measures of helicopter pilot performance were correlated: two types of computer scores and one type of safety/instructor pilot grades. Results indicated the two types of computer scores were basically interchangeable. The direction of the relationship between the different types of computer and safety-pilot measures was as expected for 76 percent of the measures examined, but statistical significance was attained in fewer cases (approximately 50 percent of the total). Reasons for any noted discrepancies are discussed along with findings about the most strongly associated measures. The computer scores and safety-pilot grades were related strongly enough to conclude that they were both accurately measuring the sample type of performance. GRA

N93-14602# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
DECISION MAKING IN A DYNAMIC TASK ENVIRONMENT: THE EFFECT OF TIME PRESSURE Final Report
J. H. KERSTHOLT 23 Jan. 1992 23 p
(AD-A256557; IZF-1992-B-1; TDCK-92-0240) Avail: CASI HC A03/MF A01

Two experiments were conducted to investigate time pressure effects on both the selected decision strategy and the quality of task performance. A dynamic task environment was used. Subjects were required to monitor the continuously changing fitness level of an athlete, and to recover the athlete whenever fitness decline had a physiological cause. Time pressure was defined by the rate at which the fitness level changed over time. The major decision problem of the subjects was to trade-off the costs of requesting information against the increasing risk of a costly consequence. The experiments differed in the incentive scheme that was used: in the first experiment, the subjects increased their chance on a bonus by saving time, whereas in the second experiment they could directly save on money. Both experiments showed a speed-up of information processing as time pressure increased. In the first experiment, subjects started to request information at the saw fitness levels in all time pressure conditions, whereas in second experiment subjects started to request information at higher fitness levels when time pressure increased. However, in both experiments performance equally deteriorated under time pressure, as indicated by the number of athlete collapses. It is concluded that even though the subjects changed their strategy and increased their speed of information processing under time pressure, performance declined more than predicted by time constraints alone. This extra effect is ascribed to the characteristics of the task environment. GRA

N93-14646# New York Univ., New York.
NEUROMAGNETIC INVESTIGATIONS OF CORTICAL REGIONS UNDERLYING SHORT-TERM MEMORY Final Report, 1 Jul. 1991 - 30 Jun. 1992
SAMUEL J. WILLIAMSON and LLOYD KAUFMAN 18 Aug. 1992 45 p
(Contract AF-AFOSR-0401-91)
(AD-A255788) Avail: CASI HC A03/MF A01

Spontaneous neuronal activity of the brain within the alpha frequency bandwidth is found to be suppressed in the visual cortex when comparing a rotated, and possibly inverted object with an

object previously seen to determine whether they are identical. Moreover, the pattern of suppression adjusts to task demands. Thus, the visual cortex participates in the processes of mental imagery. A mathematical solution for the magnetic inverse problem was developed to determine the locations of alpha suppression within the brain based on magnetic field measurements of the magnetic field power across the scalp. Behavioral studies of a person's loss of memory for the loudness of a tone can be characterized by a decaying exponential dependence on time. The characteristic lifetime is found to match to within 0.2 sec the individual's lifetime for the decay of the neuronal activation trace in primary determined neuromagnetically. GRA

N93-14660# Rochester Univ., NY. Dept. of Computer Science.
THE PERCEPTION OF ARTICULATED MOTION: RECOGNIZING MOVING LIGHT DISPLAYS Ph.D. Thesis
NIGEL H. GODDARD Jun. 1992 186 p
(AD-A256046; TR-405) Avail: CASI HC A10/MF A02

Recognition of motion sequences is a crucial ability for biological and robot vision systems. We present an architecture for the higher level processes involved in recognition of complex structured motion. The work is focused on modeling human recognition of Moving Light Displays. MLD's are image sequences that contain only motion information at a small number of locations. Despite the extreme paucity of information in these displays, humans can recognize MLD's generated from a variety of common human movements. This dissertation explores the high level representations and computational processes required for the recognition task. The structures and algorithms are articulated in the language of structured connectionist models. The implemented network can discriminate three human gaits from data generated by several actors. Recognition of any motion involves indexing into stored models of movement. We present a representation for such models, called scenarios, based on coordinated sequences of discrete motion events. A method for indexing into this representation is described. We develop a parallel model of spatial and conceptual attention that is essential for disambiguating the spatially and temporally diffuse MLD data. The major computational problems addressed are: (1) representation of time varying visual models; (2) integration of visual stimuli over time; (3) gestalt formation in and between spatially-localized feature maps and central movement representations; (4) contextual feedback to lower levels; and (5) the use of attention to focus processing on particular spatial locations and particular high level representations. Several novel connectionist mechanisms are developed and used in the implementation. GRA

N93-14788# New York Univ., New York.
COGNITION AND THE BRAIN Annual Technical Report, 15 Feb. 1991 - 14 Feb. 1992
S. J. WILLIAMSON and L. KAUFMAN 25 May 1992 119 p
(Contract AF-AFOSR-0221-90)
(AD-A255483; AFOSR-92-05446TR) Avail: CASI HC A06/MF A02

Magnetic fields associated with spontaneous neuronal activity of the cerebral cortex are shown to be locally suppressed when an area of the brain engages in a cognitive function. Suppression occurs in visual cortex when the image of an object is compared with a memory set of objects previously seen, or with the same object rotated. Suppression occurs in auditory cortex when memory of a tone is compared with a memory set of tones. Suppression occurs first over a visual cortex and subsequently over the anterior temporal area when a subject responds to a displayed word by seeking a word that rhymes with it. Significant correlations are found between the timing of cortical suppression and classic behavioral studies of reaction times. It is concluded that regional changes in cortical spontaneous activity are meaningfully related to memory scanning, image transformations, and silent speech. A computational procedure, called the minimum-norm least-square (MNLS) estimate, was developed to provide a unique solution for the magnetic inverse problem. With this algorithm, the distribution of intracellular current across the surface of cerebral cortex can be deduced from the magnetic field pattern that it produces across the scalp. This approach was generalized to provide a unique estimate for the distribution of time-average current power, obtained from the average field power. It can also be applied to determine the pattern of current power suppression when the subject is engaged in a cognitive task. GRA

N93-15067# Dartmouth Coll., Hanover, NH. Dept. of Psychiatry.
MULTIMODAL INTERACTIONS IN SENSORY-MOTOR PROCESSING Final Report, 1 Jul. 1989 - 30 Jun. 1992
MICHAEL S. GAZZANIGA 30 Jun. 1992 114 p
(Contract AF-AFOSR-0437-89)
(AD-A255780; AFOSR-92-0883TR) Avail: CASI HC A06/MF A02

Intersensory (visual/auditory) facilitation of reaction times (RT's) was examined using three different response systems: saccadic eye movements, directed manual responses (deflections of a joystick towards the target location) and simple manual responses. The data were examined in the context of race models (in which facilitation is attributed to the minimum of two random variables representing the detection times associated with the visual and auditory targets) versus neural summation coactivation models (where the facilitation is attributed to a combination of the activities within the visual and auditory channels prior to detection). The first experiment provides evidence for neural summation coactivation in all three response model. The effects of varying combinations of auditory and visual stimulus intensity were examined in the second experiment. Intensity-dependent mismatches in the auditory and visual RT's had little effect on the magnitude of the redundant targets effect, indicating that visual-auditory integration occurs over temporal intervals of at least 40 msecs. The effects of spatial correspondence (auditory and visual targets presented in spatial register or in opposite hemifields) was examined in the third experiment. Coactivation depends upon the spatial alignment of the targets for directed responses (both saccades and directed manual responses) but not simple manual RT's. GRA

N93-15184# Universitaet der Bundeswehr Muenchen, Neubiberg (Germany). Fakultaet fuer Systemdynamik und Flugmechanik.
MONITORING OF PILOT ACTIONS AS PART OF A KNOWLEDGE-BASED SYSTEM FOR PILOT ASSISTANCE [UEBERWACHUNG DER PILOTENAKTIONEN ALS TEILFUNKTION EINES WISSENSBASIERTEN PILOTEN-UNTERSTUETZUNGSSYSTEMS]
R. ONKEN, T. WITTIG, and H.-L. DUDEK (Dornier Luftfahrt G.m.b.H., Friedrichshafen, Germany) *In* DLR, Proceedings of the 16th Symposium on Aircraft Integrated Monitoring Systems p 607-627 Jan. 1992
Avail: CASI HC A03/MF A06; DLR, Wissenschaftliches Berichtswesen, Postfach 90 60 58, Cologne, Germany, HC

A development of a knowledge based monitoring and warning system for human operators of vehicles, in particular aircraft pilots, is presented. This monitoring and warning system for aircraft pilots is part of an intelligent system assisting the pilot in instrument flight operation. Besides automatic planning and plan execution aids, advice and warnings are delivered to the pilot on the basis of automatic situation assessment and monitoring of pilot actions, flight status, system status and environmental conditions. The development led to an implementation in a man-in the-loop-simulation. Some simulation test results are presented. ESA

N93-15216# Technico Southwest, Inc., Los Alamos, NM.
THE EFFECT OF PAIN ON TASK PERFORMANCE: A REVIEW OF THE LITERATURE
GERALD L. GAMACHE and ALBERT S. GLICKMAN Jul. 1992 35 p
(Contract DNA001-88-C-0207)
(AD-A254336; DNA-TR-91-178) Avail: CASI HC A03/MF A01

The authors reviewed 273 abstracts relating to pain and 36 abstracts relating to pain and task performance. Of the 309 abstracts reviewed, 93 articles were pertinent to elements of the problem and are the basis of this report; however none specifically

related burn pain to task performance. Two simple five-point scales were found that can be used to measure pain severity resulting from burns. The first is the McGill Pain Questionnaire that has been widely used, and the second is the Visual Analogue Scale which is often used together with a Verbal Rating Scale developed by Banos. Some alternatives to a five-point scale to relate pain severity to performance are presented as offering potential for further development. GRA

N93-15329# New York Univ., New York. Center for Neural Science.
HIGHER ORDER MECHANISMS OF COLOR VISION Final Report, 15 Jun. 1989 - 14 Jun. 1992
JOHN KRAUSKOPF 9 Sep. 1992 12 p
(Contract AF-AFOSR-0429-89)
(AD-A256369; TR-2; AFOSR-92-0877TR) Avail: CASI HC A03/MF A01

The main accomplishments have been: (1) Completion and publication of a comprehensive study of the effects of chromatic content, blur and contrast of targets on vernier acuity and on stereo acuity; (2) The use of a new method of measuring chromatic discrimination under conditions of constant adaptation and the publication of reports on this work; (3) Experiments on the significance of color in the perception of motion; (4) Experiments on the effects of chromatic adaptation on color matching; (5) The effects of noise masks on the detection of chromatic and luminance pulses; (6) Continuation of the study of the chromatic properties of single cells in the monkey cortex extending our experiments to Area V2; (7) Experiments on the effects of chromatic adaptation on the responses of single neurons in monkey LGN to chromatic stimuli; and (8) The development of a new system for making displays for visual experiments on TV monitors which allows at least 12 bits of accuracy in the specification of the intensity of each of the three primaries. GRA

N93-15400# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
HIGH-RESOLUTION CONTRAST CONTROL ON A VIDEO DISPLAY: METHOD AND CALIBRATION Final Report
J. M. VALETON and A. J. DEREUS 25 Aug. 1992 31 p
(AD-A256552; IZF-1992-B-7; TDCK-92-2282) Avail: CASI HC A03/MF A01

In visual psychophysics it is sometimes necessary to be able to display Luminances with 12 bit precision. This report describes a method where two 8 bit color outputs of a DeAnza IP8400 image processor are combined into a monochrome signal with an effective resolution of 12 bits. The implementation in hardware and software, and the calibration of the system are described. Measurements show that the system meets the desired specifications. GRA

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A93-13817* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
RADIATION EXPOSURE AND DOSE ESTIMATES FOR A NUCLEAR-POWERED MANNED MARS SPRINT MISSION
JOHN E. NEALY, LISA C. SIMONSEN, JOHN W. WILSON, LAWRENCE W. TOWNSEND (NASA, Langley Research Center, Hampton, VA), BRUCE G. SCHNITZLER (Idaho National Engineering Lab., Idaho Falls), GARRY D. QUALLS (Flight Mechanics and Control, Inc., Hampton, VA), and MICHELE M. GATES (Univ. Research Foundation, Greenbelt, MD) *In* Space nuclear power systems; Proceedings of the 8th Symposium, Albuquerque, NM, Jan. 6-10, 1991. Pt. 2 New York American Institute of Physics 1991 p. 531-536. refs
Copyright

A conceptual manned mission to Mars is analyzed in order to estimate potential ionizing radiation doses that may be incurred by crew members during the course of the mission. The scenario is set for a journey during the solar active period and includes a brief stay on the Martian surface. Propulsion is assumed to be provided by nuclear thermal rocket power, and estimates of the dose contributions from the reactors are included. However, due to effective shielding of the reactors by large propellant tanks, it is found that the incurred doses are principally due to the charged particle natural environment. Recent data (August-December 1989) for large solar proton events are used to simulate the flame environment, while standard models are used for the trapped particle and galactic cosmic ray contributions. Shield effectiveness for several candidate materials are investigated. Author

A93-13907
MAN-MACHINE INTERFACE ISSUES FOR SPACE NUCLEAR POWER SYSTEMS
WILLIAM R. NELSON and KJELL HAUGSET (OECD Halden Reactor Project, Norway) *In* Space nuclear power systems; Proceedings of the 8th Symposium, Albuquerque, NM, Jan. 6-10, 1991. Pt. 3 New York American Institute of Physics 1991 p. 1164-1168. refs
Copyright

The issues associated with establishing the necessary man-machine interface (MMI) guidelines for space nuclear power systems are explored. The generic human performance requirements for space-based systems are described, and the operator roles in current and advanced earth-based reactors are summarized. The development of a prototype advanced control room is considered, and preliminary ideas for using it as a testbed in establishing MMI guidelines for space nuclear systems are given. C.D.

A93-14222
HUMAN FACTORS IN DESIGN OF MILITARY AIRCRAFTS' OXYGEN SUPPLY EQUIPMENT
HUAJUN XIAO, YUMING ZHANG, and DENGYAN HE (Inst. of Aviation Medicine, Beijing, China) *In* ICAS, Congress, 18th, Beijing, China, Sept. 20-25, 1992, Proceedings. Vol. 1 Washington American Institute of Aeronautics and Astronautics, Inc. 1992 p. 553-556. refs
Copyright

Some human factors in the theoretical and practical development of the oxygen supply system in military aircraft are discussed. Various degrees of hypoxia and positive pressure breathing were achieved by three different absolute intrapulmonary pressure tests both on the ground and at an altitude of 18,000 m. It was found that the tolerance time and the psychological indices were all mainly determined by the intrapulmonary pressures applied. With simplified counterpressure protection, PPB is the principal factor compromising human tolerance. The higher the positive pressure, the more obvious the circulatory stagnant hypoxia. Based on these data, an intrapulmonary pressure of 15.3 kPa is recommended. P.D.

A93-14314
THE OPTIMUM DESIGN OF PERSONAL LIQUID COOLING SYSTEM
HONG-LIAO XIAO and GAN-YUAN XIU (Beijing Univ. of Aeronautics and Astronautics, China) *In* ICAS, Congress, 18th, Beijing, China, Sept. 20-25, 1992, Proceedings. Vol. 2 Washington American Institute of Aeronautics and Astronautics, Inc. 1992 p. 1295-1298. refs
Copyright

A liquid cooling system for alleviating heat stress in pilots is considered, and a design strategy is advanced based on a water-cooled suit and a heat sink. Optimal design parameters are derived for the suit heat-sink system including optimal criteria for power consumption and cooling effect. Heat-sink performance data

are compared for several available aircraft systems, and the potential and actual cooling capacities are compared for water-cooled suits designed for this study vs those for the Apollo mission. A recombination coefficient is defined which is useful for comparing the relative efficiencies of different suits. A reticular formation is proposed for the tubes in the proposed water-cooled suit that is argued to enhance mobility as well as the cooling effect. C.C.S.

A93-14319
THE DYNAMIC MATHEMATICAL MODEL AND DIGITAL SIMULATION OF THE ENVIRONMENTAL CONTROL SYSTEM
T. C. TIAN (Chengdu Aircraft Co., China), R. Z. SHOU, and H. S. HE (Beijing Univ. of Aeronautics and Astronautics, China) *In* ICAS, Congress, 18th, Beijing, China, Sept. 20-25, 1992, Proceedings. Vol. 2 Washington American Institute of Aeronautics and Astronautics, Inc. 1992 p. 1328-1335. refs
Copyright

A dynamic mathematical model is developed for a typical air-cycle environmental control system (ECS). The model takes into account the effects of fluid compressibility, fluid momentum, energy storage, and rotor inertia on the transient performance of ECS. The overall performance maps of turbine, compressor and fan are needed to formulate their models. An intervariable is introduced to transform the compressor's map. Their dynamic models, including ducts, are ordinary differential equations. The annular heat exchanger, due to the complexity of its structure and heat transfer in the core, more detailed analyses are presented. All the models can be used to predict the dynamic performance of components under any aircraft missions or operating conditions. The methods of state-space and finite-difference are used to solve respective models, which are efficient under small and large perturbations. It is possible to include such problems as change of state, variable thermodynamic properties, nonlinear effects, and pressure surges or flow oscillations. Author

A93-14377 National Aeronautics and Space Administration, Washington, DC.
HAZARD ALERTING AND SITUATIONAL AWARENESS IN ADVANCED AIR TRANSPORT COCKPITS
R. J. HANSMAN, CRAIG WANKE, JAMES KUCHAR, MARK MYKITYSHYN, EDWARD HAHN, and ALAN MIDKIFF (MIT, Cambridge, MA) *In* ICAS, Congress, 18th, Beijing, China, Sept. 20-25, 1992, Proceedings. Vol. 2 Washington American Institute of Aeronautics and Astronautics, Inc. 1992 p. 1826-1836. Research supported by U.S. Navy refs
(Contract NSF MSS-85-52702; NGL-22-009-640; NAG2-12; NAG2-716; NAG1-690; DTRS-57-88-C-0078TD39)
Copyright

An overview of the Advanced Cockpit Simulation Facility at the Massachusetts Institute of Technology is presented. Though detailed results depend on the specific application, graphical presentation of flight control and alert information has generally been found to be effective for situational awareness and subjectively selected by flight crews. Graphical display is most effective when it is consistent with the pilots cognitive map of the process being displayed or of the situation. R.E.P.

A93-14378
INDUSTRIAL DESIGN INFLUENCE ON TODAY'S FLIGHT DECKS
GRACE CHAN (Boeing Co., Seattle, WA) *In* ICAS, Congress, 18th, Beijing, China, Sept. 20-25, 1992, Proceedings. Vol. 2 Washington American Institute of Aeronautics and Astronautics, Inc. 1992 p. 1837-1846.
Copyright

Consideration of the pilot's work environment has become increasingly significant in commercial flight deck design due to the increased length of flights, increasingly complex air traffic situations, and increased number of duty cycles. The influence of industrial design on the modern design process is reviewed. The factors involved require that today's flight decks not only utilize advanced technology, but also create an 'ideal' flight crew work area. R.E.P.

A93-14413
STUDY OF OVERALL ANALYSIS METHOD OF THE MAN-MACHINE-ENVIRONMENT SYSTEMS
SHENGZHAO LONG, SHUJIN JIAO, SHANGUANG CHEN, YONG JIANG, and GUOHUA JIANG (Inst. of Space Medico-Engineering, Beijing, China) *In* ICAS, Congress, 18th, Beijing, China, Sept. 20-25, 1992, Proceedings. Vol. 2 Washington American Institute of Aeronautics and Astronautics, Inc. 1992 p. 2128-2133. refs
Copyright

The effects of the three key elements (the man, the machine, and the environment) on the overall performance of the man-machine-environment system - according to man-machine-environment system engineering theory - are examined using laboratory simulations. Results demonstrate that parametric changes in all three factors affect the overall system performance. It was found that changes in the machine dynamics can change the system performance by as much as a factor of 2 while a proper selection of the operator may improve the overall performance by about 60 percent. The selection of proper noise environment was found to improve the performance by about 18 percent. I.S.

A93-14727
3-D SURFACE DESCRIPTION FROM BINOCULAR STEREO
STEVEN D. COCHRAN (Carnegie Mellon Univ., Pittsburgh, PA) and GERARD MEDIONI (Southern California Univ., Los Angeles, CA) IEEE Transactions on Pattern Analysis and Machine Intelligence (ISSN 0162-8828) vol. 14, no. 10 Oct. 1992 p. 981-994. Research supported by DARPA and TRW, Inc. refs
(Contract F33615-87-C-1436)
Copyright

A stereo vision system that attempts to achieve robustness with respect to scene characteristics, from textured outdoor scenes to environments composed of highly regular man-made objects is presented. It integrates area-based and feature-based primitives. The area-based processing provides a dense disparity map, and the feature-based processing provides an accurate location of discontinuities. An area-based cross correlation, an ordering constraint, and a weak surface smoothness assumption are used to produce an initial disparity map. This disparity map is only a blurred version of the true one because of the smoothing introduced by the cross correlation. The problem can be reduced by introducing edge information. The disparity map is smoothed and the unsupported points removed. This method gives an active role to edgels parallel to the epipolar lines, whereas they are discarded in most feature-based systems. Very good results have been obtained on complex scenes in different domains. I.E.

A93-15057
FOR SPACE SUITS - THE MULTIFUNCTION PRESSURE REDUCER-REGULATOR OF INTERTECHNIQUE [POUR LES SCAPHANDRES DE L'ESPACE - LE DETENDEUR-REGULATEUR MULTIFONCTIONS D'INTERTECHNIQUE]
ROBERT SCHEGERIN (Intertechnique, Plaisir, France) L'Aeronautique et l'Astronautique (ISSN 0001-9275) no. 145 1990 p. 46-48. In French.
Copyright

The design and development of a dual-mode pressure regulator for EVA utilization is presented. This equipment provides the regulated oxygen pressure necessary for the EVA suit for Hermes. The regulator also allows high purge flow during donning of the suit. New technologies have been developed to provide a very high degree of safety. R.E.P.

A93-15419
ARMY COCKPIT DELETHALIZATION PROGRAM
W. B. SHOPE, RICKY L. GRETH, and MARK S. PFAFF (LME,

Inc., Warminster, PA) SAFE Journal vol. 22, no. 5 Sept.-Oct. 1992 p. 53-61.
Copyright

Biodynamic simulations, design studies, and experimental data are undertaken to determine strategies for reducing secondary cockpit injuries among helicopter pilots. The Army Cockpit Delethalization program is based on studies of the LHX attack helicopter and the V-22 tilt-wing VSTOL, and specific attention is given to reducing crewmember forward movement, lateral displacement, and rebound impacts. A baseline computer simulation is developed for combined models of cockpit, seat occupant, and vehicle motion. Two delethalization concepts are designed: an automatic G-sensing shoulder-strap retractor/tensioner and an advanced restraint harness. An active inflatable bladder for head restraint is also developed by means of the numerical simulations. The restraint device offer complementary protections for helicopter pilots including reduced torso and head displacement, reduced arm flail, and reduced inertial movement upon impact. The simulations are supported by experimental data and suggest that the combined delethalization concepts can reduce the levels of secondary cockpit injuries. C.C.S.

A93-15583* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
MICROGRAVITY FLIGHT TESTING OF A LABORATORY ROBOT
ELAINE M. HINMAN (NASA, Marshall Space Flight Center, Huntsville, AL) *In* Guidance and control 1991; Proceedings of the Annual Rocky Mountain Guidance and Control Conference, Keystone, CO, Feb. 2-6, 1991 San Diego, CA Univelt, Inc. 1991 p. 113-118.
(AAS PAPER 91-035) Copyright

A review is given of the conditions and preparations for studying the performance of a robotic laboratory manipulator under microgravity conditions and by means of dynamic simulations. The robotic arm is fitted with accelerometers, incorporated into a materials-transfer workcell, and flown on a microgravity simulator. A software package based on the Lagrangian form of the equations of motion is used for dynamic analysis and control-systems development of the arm. C.C.S.

A93-15588
SPACE TELEROBOTIC RESEARCH AND APPLICATIONS AT SPACE SYSTEMS/LORAL
SCOTT W. TILLEY, MICHAEL G. HOLLARS, COLIN M. FRANCIS, and ALFRED H. TADROS (Space Systems/Loral, Palo Alto, CA) *In* Guidance and control 1991; Proceedings of the Annual Rocky Mountain Guidance and Control Conference, Keystone, CO, Feb. 2-6, 1991 San Diego, CA Univelt, Inc. 1991 p. 179-185. refs
(AAS PAPER 91-046) Copyright

Spacecraft servicing is studied for NASA and began R&D to analyze space manipulators and their operational control in a laboratory environment. Current research on teleoperator control focuses on utilizing impedance control on a kinematically redundant manipulator. Impedance control provides a unified approach for simultaneously controlling manipulator position and force interaction with the environment. A simple peg-in-hole insertion under teleoperator control was successfully demonstrated without bounce or undesirable force overshoots. Further features are being added to demonstrate force guided assembly tasks under supervisory control in the presence of large time delay. Author

A93-15665
TRANSFER EFFECTS OF SCENE CONTENT AND CROSSWIND IN LANDING INSTRUCTION
GAVAN LINTERN and WILLIAM V. GARRISON (Illinois Univ., Urbana) International Journal of Aviation Psychology (ISSN 1050-8414) vol. 2, no. 3 1992 p. 225-244. refs
(Contract MDA903-86-C-0169)
Copyright

Transfer of landing skills was tested from a high-detail pictorial, low-detail pictorial, or symbolic scene and from a zero, moderate, or high level of crosswind to a high-detail pictorial scene and a moderate level of crosswind. There were significant differential transfer effects as assessed by measures of accuracy and stability in lateral control. Training with pictorial scenes (whether of high or low detail) was superior to training with a symbolic scene, but there was no general transfer advantage from training with high versus low scene detail. Nor was there any general advantage of training with the transfer level of crosswind. In contrast to the prediction of a high-fidelity theory transfer, the data show that values of crosswind higher or lower than the transfer value can be advantageous in certain circumstances. Author

A93-17072
SUCTION-CUP SHOES FOR ASTRONAUTS - A NEW METHOD OF FOOT RESTRAINT
M. DIDIER, C. JONES, J. VAN DER HOEK, and W. VAN HOOGSTRATEN (ESTEC, Noordwijk, Netherlands) ESA Bulletin (ISSN 0376-4265) no. 71 Aug. 1992 p. 48-50.
Copyright

The search for the ideal type of foot restraint for astronauts to use when performing tasks within a space vehicle has been underway since space vehicles became large enough to give an astronaut room to 'float' away from the job at hand. Several solutions have been tried, including clamp-type devices and foot loops at strategic locations, but each type has drawbacks. ESA has developed an alternative, a running shoe with suction cups attached to the sole. It has been tested successfully during parabolic flights and on the IML-1 mission. It is well suited to short-duration tasks or delicate tasks during which astronauts must be confident that they will remain firmly in place. When an improved type of suction cup has been found, NASA will test the shoes again on a future Shuttle flight. Author

A93-17075
ZERO-GRAVITY UNDERWATER SIMULATIONS FOR THE COLUMBUS PROGRAMME - OUTCOME OF THE FIRST CAMPAIGNS
C. VIBERTI and P. COLSON (ESTEC, Noordwijk, Netherlands) ESA Bulletin (ISSN 0376-4265) no. 71 Aug. 1992 p. 64-70.
Copyright

The programmed tasks assigned to the Columbus Attached Laboratory aboard the international Space Station Freedom are presented. In-orbit servicing of subsystem hardware and the exchanging of massive payload racks are to be routine tasks for the flight crews. The investigation of those tasks through a series of zero-gravity simulations conducted underwater are described. R.E.P.

A93-17432* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM - CELSS
JOHN C. SAGER (NASA, Kennedy Space Center, Cocoa Beach, FL) *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 66-74. refs
Copyright

The Controlled Ecological Life Support System (CELSS) Program, a NASA effort to develop bioregenerative systems which provide required life support elements for crews on long duration space missions or extraterrestrial planetary colonizations, is briefly discussed. The CELSS analytical requirements are defined in relation to the life support objectives and priorities of a CELSS. The first phase of the CELSS Breadboard Concept is shown. C.D.

A93-17433
CHEMICAL AND TOXICOLOGICAL ASSESSMENT OF ENVIRONMENTAL CONTAMINANTS IN THE LUNAR-CHEMICAL ANALYSIS LABORATORY
DAVID L. STALLING (ABC Labs., Inc., Columbia, MO) *In* A lunar-based chemical analysis laboratory Hampton, VA A.

Deepak Publishing 1992 p. 75-81. refs
Copyright

The state of the art in assessing environmental contaminants using the Lunar-Chemical Analysis Laboratory is briefly reviewed. The separation of contaminants, their detection, and their analysis in controlled ecological life support systems (CELSS) is addressed along with the assessment of contaminant hazard to biological energy and production systems. New technologies involved in sampling CELSS systems and lunar base atmosphere for contaminants and assessing the biological activity of contaminants is addressed. C.D.

N93-12545# Anacapa Sciences, Inc., Fort Rucker, AL.
OPERATOR WORKLOAD PREDICTIONS FOR THE REVISED AH-64A WORKLOAD PREDICTION MODEL. VOLUME 2: APPENDIXES A THROUGH H Interim Report, Sep. 1988 - Dec. 1991
DAVID B. HAMILTON and CARL R. BIERBAUM Jul. 1992 414 p
(Contract MDA903-87-C-0523)
(AD-A254939; ASI690-354-92-VOL-2; ARI-RN-92-62-VOL-2)
Avail: CASI HC A18/MF A04

Under a previous contract, researchers used a composite scenario to conduct a comprehensive task analysis of the AH-64A attack mission. The analysis produced workload estimates and decision rules for developing an AH-64A workload prediction model. For this research, the task analysis/workload (TAWL) methodology was used to construct a workload prediction model. The TAWL Operator Simulation System (TOSS) was used to implement the model on an IBM-compatible microcomputer, and the original function and task analysis was refined to produce a more accurate simulation of crew task activity. In addition, the ordinal workload rating scales used in the original analysis were replaced with equal-interval scales. The predictions generated by the model constructed for this research indicate that under optimum conditions (1) neither the pilot nor the copilot/gunner experiences excessive workload, (2) the pilot has higher overall workload than the copilot/gunner in most mission segments, and (3) AH-64A workload is high relative to other Army aircraft that have been analyzed for workload. This model can be used as a baseline for analyzing future modifications to the aircraft. Volume 1 (ARI Research Note 92-61) of the report summarizes the results of the research, and contains a 5.25-inch floppy diskette with model data files. This report (Volume 2) contains the appendixes, which present the AH-64A mission/task/workload analysis, decision rules, and workload predictions. GRA

N93-12576# Mitre Corp., Bedford, MA.
MEASURES OF USER-SYSTEM INTERFACE EFFECTIVENESS: ASSESSMENT OF STRUCTURED JUDGMENT EVALUATION TECHNIQUES FOR GRAPHICAL, DIRECT-MANIPULATION STYLE INTERFACES
DONNA L. CUOMO and CHARLES D. BOWEN Jul. 1992 44 p
(AD-A254493; MTR-92B0000047V2) Avail: CASI HC A03/MF A01

The results of the second phase of the MITRE sponsored research project on developing measures of user-system interface effectiveness are presented. This project is concerned with developing methods and measures of user-system interface effectiveness for command and control systems with graphical, direct manipulation style interfaces. Due to the increased use of user interface prototyping during concept definition and demonstration/validation phases, the opportunity exists for human factors engineers to apply evaluation methodologies early enough in the life cycle to make an impact on system design. Understanding and improving user-system interface (USI) evaluation techniques is critical to this process. In 1986, Norman proposed a descriptive stages of user activity model of human-computer interaction (HCI). Hutchins, Hollin, and Norman (1986) proposed concepts of measures based on the model which would assess the directness of the engagements between the user and the interface at each stage of the model. This phase of our research program involved applying three USI evaluation techniques to a single interface, and assessing which, if any, provided information on the directness of engagement at each stage of Norman's model. We also classified the problem types identified according to the Smith and Mosier (1986) functional areas. The three techniques used were cognitive walkthrough, heuristic evaluation, and guidelines. GRA

N93-12609# Anacapa Sciences, Inc., Fort Rucker, AL.
HUMAN FACTORS RESEARCH IN AIRCREW PERFORMANCE AND TRAINING: 1986-1991 Final Summary Report, Oct. 1986 - Dec. 1991
D. M. MCANULTY Jul. 1992 170 p
(Contract MDA903-87-C-0523)
(AD-A254455; ASI690-348-91; ARI-TR-954) Avail: CASI HC A08/MF A02

This report presents summary descriptions of the research performed by Anacapa Sciences, Inc., for the U.S. Army Research Institute for the Behavioral and Social Sciences Fort Rucker Field Unit. This effort was entitled Human Factors Research in Aircrew Performance and Training. From 9 Oct. 1986 - 31 Dec. 1991, Anacapa personnel worked on 42 research projects and 20 technical advisory services in emerging aviation systems design, manpower and personnel programs, aviator training, and aviation safety research. The report also describes research and development projects that were conducted under 17 subcontracts to Anacapa Sciences. These descriptions contain the following: (1) a background section that describes the rationale for the project and specifies the research objectives; (2) a research approach section that describes the tasks and activities required to meet the project objectives; and (3) a work completed section that may include research findings or, in the case of developmental activities, a description of the research products. GRA

N93-12712# Pacific Northwest Lab., Richland, WA.
HUMAN PERCEPTUAL DEFICITS AS FACTORS IN COMPUTER INTERFACE TEST AND EVALUATION
S. E. BOWSER Jun. 1992 6 p Presented at the 1992 Industrial Ergonomics and Safety Conference, Denver, CO, 10-14 Jun. 1992
(Contract DE-AC06-76RL-01830)
(DE92-019124; PNL-SA-20626; CONF-9206237-1) Avail: CASI HC A02/MF A01

Issues related to testing and evaluating human computer interfaces are usually based on the machine rather than on the human portion of the computer interface. Perceptual characteristics of the expected user are rarely investigated, and interface designers ignore known population perceptual limitations. For these reasons, environmental impacts on the equipment will more likely be defined than will user perceptual characteristics. The investigation of user population characteristics is most often directed toward intellectual abilities and anthropometry. This problem is compounded by the fact that some deficits capabilities tend to be found in higher-than-overall population distribution in some user groups. The test and evaluation community can address the issue from two primary aspects. First, assessing user characteristics should be extended to include tests of perceptual capability. Secondly, interface designs should use multimode information coding. DOE

N93-12732# Naval Air Warfare Center, Patuxent River, MD. Aircraft Div.
INTEGRATION OF EXTERIOR LIGHTING SYSTEMS AND NIGHT VISION IMAGING SYSTEMS
S. KINNEY and R. SIMPSON 3 Jun. 1992 42 p
(AD-A254826; NAWCADPAX-TM-92-37-SY) Avail: CASI HC A03/MF A01

The use of Night Vision Imaging Systems (NVIS) by military aviators has had a major impact on the design and integration philosophy of interior and exterior lighting systems. The integration of NVIS exterior lighting systems to meet the associated mission requirements is in the early stages of development. Operational performance and military specification requirements have not been updated and established. This technical memorandum presents information and lessons learned from development, test, and evaluation (DT and E) support of the A-12 program and

development of test procedures to evaluate exterior lighting systems. During the DT and E support of the A-12 program, major exterior lighting issues had to be resolved. This evolution generated experience associated with exterior lighting and NVIS performance requirements. The information presented is not all inclusive but contains information to be used for updating exterior lighting Military Specifications requirements and test procedures. The additional integration requirements and design considerations will improve the utility of NVIS thus improving aircraft combat survivability and performance for various mission requirements. GRA

N93-12860# Catholic Univ. of America, Washington, DC. Cognitive Science Lab.

ADAPTIVE AUTOMATION AND HUMAN PERFORMANCE. 3: EFFECTS OF PRACTICE ON THE BENEFITS AND COSTS OF AUTOMATION SHIFTS Final Report

RAJA PARASURAMAN, BRIAN HILBURN, ROBERT MOLLOY, and INDRAMANI SINGH Oct. 1991 42 p Sponsored by Naval Air Warfare Center

(AD-A254381; NAWCADWAR-92037-60) Avail: CASI HC A03/MF A01

Adaptive automation, or adaptive function allocation, is thought to maximize the benefits associated with cockpit automation while maintaining pilot involvement, enhancing situation awareness, and regulating workload. These claims have not been tested empirically. The present study examined the effects of short-cycle adaptive automation and practice on performance-of flight-related functions in a multi-task environment. Twenty four non pilot subjects were tested on a PC-based flight-simulation task that included three primary flight functions -- tracking, monitoring, and fuel management. Each function could be automated or performed manually. The results provide preliminary evidence that dynamic automation shifts over short cycles, of the type likely in adaptive systems, benefit performance of flight-related tasks, with no evidence of costs to performance following the return to manual control. Benefits are realized despite the added workload of supervisory control of automated functions. However, training procedures other than simple practice may be necessary to maximize and maintain the performance benefits associated with adaptive automation. GRA

N93-12960# Army Research Inst. of Environmental Medicine, Natick, MA.

EFFECT OF PROTECTIVE CLOTHING ENSEMBLES ON ARTILLERY BATTERY CREW PERFORMANCE Final Report

PATRICIA C. SZLYK, DAVID M. CARETTI, INGRID V. SILS, OREST ZUBAL, and JIM A. FAUGHN 17 Jul. 1992 41 p

(AD-A254327; USARIEM-T8-92) Avail: CASI HC A03/MF A01

Performance of three 9-man crews was evaluated while firing 90 rounds in a safe and expedient manner, with swabbing of the breech after each round. Each 9-man crew fired on three non-consecutive days; the independent variable among days was the MOPP level worn (BDU vs MOPP 4 vs MOPP 4 with cooling). All 90 rounds were fired by all three crews when wearing BDU. Despite similar climatic conditions, 2 of the 3 MOPP 4 iterations were prematurely terminated due to high rectal temperatures and/or presyncopal symptoms. During the MOPP 4 trial average time to fire one round increased from the first to the second 45 rounds. In contrast crews wearing BDU did not increase firing time. When cooling was added to the MOPP 4 configuration (cool MOPP), all iterations were completed and performance was enhanced despite warmer environmental conditions. As in the BDU trials, the time to fire a single round was unchanged over time, and was significantly less than that for MOPP 4. Significantly higher sweat losses in MOPP 4 were reflected in the crew's enhanced perception of sweatiness, thirst, hyperthermia, and headache. Full encapsulation of crew members in chemical protective gear imposed a heat stress which reduced work tolerance and performance, but these decrements were lessened by microclimate cooling to the thorax and face. GRA

N93-12966*# Alabama Univ., Huntsville. Consortium for the Space Life Sciences.

MICROBIOLOGICAL METHODS FOR THE WATER RECOVERY SYSTEMS TEST, REVISION 1.1 Final Report

TIM RHOADS, M. V. KILGORE, JR., and A. T. MIKELL, JR. 23 Feb. 1990 116 p Revised

(Contract NAS8-36955)

(NASA-CR-184390; NAS 1.26:184390; UAH-835-REV-1.1) Avail: CASI HC A06/MF A02

Current microbiological parameters specified to verify microbiological quality of Space Station Freedom water quality include the enumeration of total bacteria, anaerobes, aerobes, yeasts and molds, enteric bacteria, gram positives, gram negatives, and E. coli. In addition, other parameters have been identified as necessary to support the Water Recovery Test activities to be conducted at the NASA/MSFC later this year. These other parameters include aerotolerant eutrophic mesophiles, legionellae, and an additional method for heterotrophic bacteria. If inter-laboratory data are to be compared to evaluate quality, analytical methods must be eliminated as a variable. Therefore, each participating laboratory must utilize the same analytical methods and procedures. Without this standardization, data can be neither compared nor validated between laboratories. Multiple laboratory participation represents a conservative approach to insure quality and completeness of data. Invariably, sample loss will occur in transport and analyses. Natural variance is a reality on any test of this magnitude and is further enhanced because biological entities, capable of growth and death, are specific parameters of interest. The large variation due to the participation of human test subjects has been noted with previous testing. The resultant data might be dismissed as 'out of control' unless intra-laboratory control is included as part of the method or if participating laboratories are not available for verification. The purpose of this document is to provide standardized laboratory procedures for the enumeration of certain microorganisms in water and wastewater specific to the water recovery systems test. The document consists of ten separate cultural methods and one direct count procedure. It is not intended nor is it implied to be a complete microbiological methods manual. Author

N93-12983# HydroQual, Inc., Mahwah, NJ.

ULTRAVIOLET DISINFECTION TECHNOLOGY ASSESSMENT

O. KARL SCHEIBLE, ASHOK GUPTA, and DENNIS SCANNELL Sep. 1992 108 p

(Contract EPA-68-08-0023)

(PB92-222868; EPA/832/R-92/004) Avail: CASI HC A06/MF A02

Ultraviolet (UV) disinfection systems are being widely considered for application to treated wastewaters, for both new plants and retrofitting existing plants in lieu of conventional chlorination facilities. The technology is relatively new, with most systems installed over the past three to four years. The report presents an assessment of the status of the technology relative to the type and size of UV facilities that are currently operating, and discusses the trends in system design, configuration, and operations. The design and operation of selected plants are reviewed; this information and current practices are then summarized to give a perspective of key considerations that should be incorporated into the design of UV facilities. Finally, a review of costs associated with the construction and operation of UV systems is presented, based on data generated from this assessment. GRA

N93-12990*# Spectra Research Systems, Inc., Huntsville, AL. Systems Technology Group.

ECLSS EVOLUTION: ADVANCED INSTRUMENTATION INTERFACE REQUIREMENTS. VOLUME 3: APPENDIX C

3 Sep. 1991 40 p

(Contract NAS8-38781)

(NASA-CR-184367; NAS 1.26:184367;

SRS/STG-TR92-01-VOL-3-APP-C) Avail: CASI HC A03/MF A01

An Advanced ECLSS (Environmental Control and Life Support System) Technology Interfaces Database was developed primarily to provide ECLSS analysts with a centralized and portable source

of ECLSS technologies interface requirements data. The database contains 20 technologies which were previously identified in the MDSSC ECLSS Technologies database. The primary interfaces of interest in this database are fluid, electrical, data/control interfaces, and resupply requirements. Each record contains fields describing the function and operation of the technology. Fields include: an interface diagram, description applicable design points and operating ranges, and an explaination of data, as required. A complete set of data was entered for six of the twenty components including Solid Amine Water Desorbed (SAWD), Thermoelectric Integrated Membrane Evaporation System (TIMES), Electrochemical Carbon Dioxide Concentrator (EDC), Solid Polymer Electrolysis (SPE), Static Feed Electrolysis (SFE), and BOSCH. Additional data was collected for Reverse Osmosis Water Reclaimation-Potable (ROWRP), Reverse Osmosis Water Reclaimation-Hygiene (ROWRH), Static Feed Solid Polymer Electrolyte (SFSPE), Trace Contaminant Control System (TCCS), and Multifiltration Water Reclamation - Hygiene (MFWRH). A summary of the database contents is presented in this report.
Author

N93-13450*# Analytics, Inc., Willow Grove, PA.
OCULAR ATTENTION-SENSING INTERFACE SYSTEM Final Technical Report, 1977
ALLEN ZAKLAD, FLOYD A. GLENN, III, HELENE P. IAVECCHIA, and JAMES M. STOKES Dec. 1986 76 p
(Contract NAS7-932; SBIR-06.05-4100)
(NASA-CR-190884; NAS 1.26:190884) Avail: CASI HC A05/MF A01

The purpose of the research was to develop an innovative human-computer interface based on eye movement and voice control. By eliminating a manual interface (keyboard, joystick, etc.), OASIS provides a control mechanism that is natural, efficient, accurate, and low in workload. Author

N93-13464 Institute of Sound and Vibration Research, Southampton (England).
DESIGN GUIDE FOR THE ERGONOMIC ASPECTS OF HELICOPTER CREW SEATING
A. J. MESSENGER, R. STRATFORD, and M. J. GRIFFIN Oct. 1992 60 p
(ISVR-TR-209) Copyright Avail: CASI HC A04/MF A01

This Design Guide provides an aid to the design of new helicopter crew seats, the improvement of existing seats and the comparison of alternative seats. Methods of measuring seat dimensions, angles and contouring are defined. Recommendations for the dimensions, angles and contouring of the seat pan, backrest, armrests and headrest are based on the principle of matching seat dimensions to the relevant dimensions of the user population. The dimensions suggested are appropriate for British males and females aged between 19 and 45 years. The Design Guide has been formulated so that the suggested dimensions can be replaced by those appropriate to a different user population. Cushion material, cushion coverings, routing of harnessing, the positioning of seat controls, eye position, the operation of controls and ingress and egress from the seat are also considered. The Design Guide also contains recommendations for the subjective testing of seat comfort and the dynamic testing of the transmission of vibration through helicopter crew seats. Author

N93-13486 Minnesota Univ., Minneapolis.
DESIGN, CONSTRUCTION, AND CONTROL OF A TWO DEGREE-OF-FREEDOM ELECTRIC DIRECT-DRIVE HUMAN POWER AMPLIFIER Ph.D. Thesis
MING-GUO HER 1991 130 p
Avail: Univ. Microfilms Order No. DA9212057

This thesis describes the design, construction, and control of a class of computer controlled human-assisted robotic systems. This robotic system is a robot worn by a human to increase human mechanical ability. The system is referred to as an extender since it extends the human's mechanical ability to maneuvering objects. Commands are transferred to the extender via the contact forces between the human and the extender, eliminating the need for joystick, push-button or keyboard to transfer such commands. Instead, the operator becomes an integral part of the extender while executing the task. When the worker uses the extender to touch and manipulate a load, the extender transfers to her/his arm, and natural feedback, a scaled-down value of the actual load weight which the extender is manipulating: the human 'feels' the load weight in the manipulations. An experimental electric two-degree-of-freedom direct-drive extender has been designed and constructed to this Ph.D. study. With high-torque/wide-bandwidth actuators, and the direct-drive architecture, this experimental extender can track the human arm maneuvers to the extent that the human feels minimum restriction in his motions. The extender is interfaced with an 486/25 IBM AT compatible computer for control. The human and environment dynamics play significant roles in the performance and stability of an extender. Modelling the human environment dynamics inside a control loop were performed first. Then expressions for the performance and stability were derived based on the human and environment dynamic models. The stability analysis, and the performance specifications lead to the controller design methods. The dynamic models, the control technique, and the trade-off between the stability and performance specification were verified experimentally by using the prototype 2 degree of freedom extender. Dissert. Abstr.

N93-13571*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A HEALTH CARE SYSTEM FOR THE SPACE STATION
1992 15 p Prepared in cooperation with Krug International, Houston, TX LIMITED REPRODUCIBILITY: More than 20% of this document may be affected by color photographs Original contains color illustrations
(NASA-TM-108093; NAS 1.15:108093) Avail: CASI HC A03/MF A01; 15 functional color pages

Life science will be one of the pacing technologies for long duration manned spaceflight. The ability to effectively deliver state-of-the-art inflight medical care will have a major impact on crew health and mission success. The future Space Station crews will participate in missions of extended duration with limited capability for emergency return. This factor alone places great responsibility on program designers to ensure the health, safety, and well-being of the crews. The Health Maintenance Facility (HMF) under development at the Johnson Space Center is described.
L.R.R.

N93-13692*# National Aeronautics and Space Administration, Washington, DC.
SUITED FOR SPACEWALKING: A TEACHER'S GUIDE WITH ACTIVITIES
GREGORY L. VOGT, ed. (National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.) and CHERYL A. MANNING, ed. Mar. 1992 65 p
(NASA-EP-279; NAS 1.19:279) Avail: CASI HC A04/MF A01

This publication is an activity guide for teachers on spacesuits and spacewalking. It uses the intensive interest many children have in space exploration as a launching point for hands-on-opportunities. The guide begins with brief discussions of the space environment, the history of space walking, the Space Shuttle spacesuit, and working in space. These are followed by a series of activities that enable children to explore the space environment as well as the science and technology behind the functions of spacesuits. The activities are not rated for specific grade levels because they can be adapted for students of many ages. The guide concludes with a brief glossary as well as references and resources. R.L.B.

N93-13717*# Arizona Univ., Tucson. Aerospace and Mechanical Engineering.
THERMAL CONTROL SYSTEMS FOR LOW-TEMPERATURE HEAT REJECTION ON A LUNAR BASE Progress Report
K. R. SRIDHAR and MATTHIAS GOTTMANN Oct. 1992 63 p
(Contract NAG5-1572)

(NASA-CR-191286; NAS 1.26:191286) Avail: CASI HC A04/MF A01

In this report, Rankine-cycle heat pumps and absorption heat pumps (ammonia-water and lithium bromide-water) have been analyzed and optimized for a lunar base cooling load of 100 kW. For the Rankine cycle, a search of several commonly used commercial refrigerants provided R11 and R717 as possible working fluids. Hence, the Rankine-cycle analysis has been performed for both R11 and R717. Two different configurations were considered for the system--one in which the heat pump is directly connected to the rejection loop and another in which a heat exchanger connects the heat pump to the rejection loop. For a marginal increase in mass, the decoupling of the rejection loop and the radiator from the heat pump provides greater reliability of the system and better control. Hence, the decoupled system is the configuration of choice. The optimal TCS mass for a 100 kW cooling load at 270 K was 5940 kg at a radiator temperature of 362 K. R11 was the working fluid in the heat pump, and R717 was the transport fluid in the rejection loop. Two TCS's based on an absorption-cycle heat pump were considered, one with an ammonia-water mixture and the other with a lithium bromide-water mixture as the working fluid. A complete cycle analysis was performed for these systems. The system components were approximated as heat exchangers with no internal pressure drop for the mass estimate. This simple approach underpredicts the mass of the systems, but is a good 'optimistic' first approximation to the TCS mass in the absence of reliable component mass data. The mass estimates of the two systems reveal that, in spite of this optimistic estimate, the absorption heat pumps are not competitive with the Rankine-cycle heat pumps. Future work at the systems level will involve similar analyses for the Brayton- and Stirling-cycle heat pumps. The analyses will also consider the operation of the pump under partial-load conditions. On the component level, a capillary evaporator will be designed, built, and tested in order to investigate its suitability in lunar base TCS and microgravity two-phase applications. Author

N93-13874# Aerospace Medical Research Labs., Wright-Patterson AFB, OH.

HYBRID 2 AND HYBRID 3 DUMMY NECK PROPERTIES FOR COMPUTER MODELING Interim Report, Jan. 1991 - Feb. 1992

ERIC K. SPITTLE, DONNA J. MILLER, BUFORD W. SHIPLEY, JR., and INTS KALEPS Feb. 1992 138 p

(Contract AF PROJ. 7231)

(AD-A255544; AL-TR-1992-0049) Avail: CASI HC A07/MF A02

Existing rigid body dynamics and finite element computer codes do not have adequate databases for manikin neck structures to properly model head/neck system dynamics occurring in crash or ejection testing. This report describes measured static stiffness and dynamic damping and stiffness characteristics of the Hybrid 2 and Hybrid 3 manikin necks and uses these data to improve the current manikin neck data sets of the Articulated Total Body (ATB) model and the Head Spine Model (HSM). The Hybrid 2 and Hybrid 3 manikin necks are used extensively throughout the automotive industry, the Department of Transportation, and the Department of Defense for safety testing. Static stiffness characteristics were determined from loading and unloading the necks in flexion, extension, and lateral bending. Dynamic damping and stiffness characteristics were determined from abrupt deceleration tests in the 'X' and 'Y' directions. Current computer data sets for the Hybrid 2 and Hybrid 3 necks were compared to the experimental dynamic results to determine inconsistencies. The data sets were, then revised using the results obtained experimentally. Finally, the new data sets were compared to the experimental dynamic results to show improvements. GRA

N93-13909 Oxford Univ. (England).

FORMAL ASPECTS OF HUMAN-COMPUTER INTERACTION Ph.D. Thesis

GREGORY D. ABOWD 1991 246 p

Avail: Univ. Microfilms Order No. BRD-96182

A constructive application of formal methods to the study of human-computer interaction is addressed. Specifically, we are interested in promoting a principled approach to the analysis and design of interactive systems that will accompany existing heuristic techniques. Previous formal approaches have concentrated on general and abstract mathematical models of interactive systems, proving that psychologically valid principles of interaction can be expressed in a language suitable for computation. These abstract models, however, are too far removed from an actual design practice which is strongly influenced by common sense and liable to break down in the face of complexity. Our efforts are focussed toward retaining the mathematical grounding of previous formalisms while providing additional insight and direction for design practice. We introduce a unifying framework for the informal description of a user, a system, and the interface that sits between them. This interaction framework provides the context for our research and motivates the properties of interaction that we wish to formalize. We adopt the view of an interactive system as a collection of agents based on the stimulus-response model. We provide a mathematical model of the agent capable of expressing interactive properties relating the goals of interaction with the visible consequences of that interaction. We also provide a language for agents which allows a natural expression of an agent's internal state-based behavior and its external event-based behavior. We contribute further to practical design issues by introducing templates to relate a task analysis to a specification of a system to support the tasks and an interface to adequately portray that functionality to the user. Finally, we initiate the formal investigation of multiagent architectures. This concludes the mapping of properties on abstract models of interactive systems down to properties on more implementation-based models. Dissert. Abstr.

N93-13991*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

THE ENVIRONMENTAL CONTROL AND LIFE-SUPPORT SYSTEM FOR A LUNAR BASE: WHAT DRIVES ITS DESIGN

WARREN D. HYPES (Bionetics Corp., Hampton, VA.) and JOHN B. HALL, JR. *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 503-511 Sep. 1992

Avail: CASI HC A02/MF A03

The purpose of this paper is to identify and briefly discuss some of the ground rules and mission scenario details that become drivers of the environmental control and life support (ECLS) system design and of the logistics related to the design. This paper is written for mission planners and non-ECLS system engineers to inform them of the details that will be important to the ECLS engineer when the design phase is reached. In addition, examples illustrate the impact of some selected mission characteristics on the logistics associated with ECLS systems. The last section of this paper focuses on the ECLS system technology development sequence and highlights specific portions that need emphasis. Author

N93-13992*# Institute of Ecotechnics, London (England).

LIFE SYSTEMS FOR A LUNAR BASE

MARK NELSON, PHILIP B. HAWES (Sarbid Ltd., Oracle, AZ.), and MARGRET AUGUSTINE (Space Biospheres Ventures, Oracle, AZ.) *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 513-518 Sep. 1992

Avail: CASI HC A02/MF A03

The Biosphere 2 project is pioneering work on life systems that can serve as a prototype for long-term habitation on the Moon. This project will also facilitate the understanding of the smaller systems that will be needed for initial lunar base life-support functions. In its recommendation for a policy for the next 50 years in space, the National Commission on Space urged, 'To explore and settle the inner Solar System, we must develop biospheres of smaller size, and learn how to build and maintain them' (National Commission on Space, 1986). The Biosphere 2 project, along with its Biospheric Research and Development Center, is a materially closed and informationally and energetically open system capable of supporting a human crew of eight, undertaking work to

meet this need. This paper gives an overview of the Space Biospheres Ventures' endeavor and its lunar applications.
Author

N93-13993*# Walt Disney World Co., Lake Buena Vista, FL. EPCOT Center.
LUNAR BASE CELSS: A BIOREGENERATIVE APPROACH
G. W. EASTERWOOD, J. J. STREET (Florida Univ., Gainesville.), J. B. SARTAIN (Florida Univ., Gainesville.), D. H. HUBBELL (Florida Univ., Gainesville.), and H. A. ROBITAILLE *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 519-523 Sep. 1992
Avail: CASI HC A01/MF A03

During the twenty-first century, human habitation of a self-sustaining lunar base could become a reality. To achieve this goal, the occupants will have to have food, water, and an adequate atmosphere within a carefully designed environment. Advanced technology will be employed to support terrestrial life-sustaining processes on the Moon. One approach to a life support system based on food production, waste management and utilization, and product synthesis is outlined. Inputs include an atmosphere, water, plants, biodegradable substrates, and manufacutured materials such as fiberglass containment vessels from lunar resources. Outputs include purification of air and water, food, and hydrogen (H2) generated from methane (CH4). Important criteria are as follows: (1) minimize resupply from Earth; and (2) recycle as efficiently as possible. Author

N93-13994*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
CROP GROWTH AND ASSOCIATED LIFE SUPPORT FOR A LUNAR FARM
TYLER VOLK (New York Univ., New York.) and HATICE CULLINGFORD *In its* The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 525-530 Sep. 1992
Avail: CASI HC A02/MF A03

Supporting human life on a lunar base will require growing many different food crops. This paper investigates the growth dynamics of four crops (wheat, soybeans, potatoes, and lettuce) for general similarities and differences, along with associated material flows of the gases, liquids, and solids in a lunar farm. The human dietary requirements are compared with the protein, carbohydrate, and lipid contents of these hydroponically grown, high-productivity crops to derive a lunar farm diet. A simple and general analytical model is used to calculate the mass fluxes of CO2, H2O, HNO3, and O2 during the life cycle of each of the four crops. The resulting farm crop areas and corresponding biomass production rates are given. One significant conclusion of this study is that there is a 'lipid problem' associated with the incorporation of these four crops into a viable diet. Author

N93-13996*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
ENGINEERING VERIFICATION OF THE BIOMASS PRODUCTION CHAMBER
R. P. PRINCE, W. M. KNOTT, III, J. C. SAGER, and J. D. JONES (National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.) *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 537-542 Sep. 1992
Avail: CASI HC A02/MF A03

The requirements for life support systems, both biological and physical-chemical, for long-term human attended space missions are under serious study throughout NASA. The KSC 'breadboard' project has focused on biomass production using higher plants for atmospheric regeneration and food production in a special biomass production chamber. This chamber is designed to provide information on food crop growth rate, contaminants in the chamber that alter plant growth requirements for atmospheric regeneration, carbon dioxide consumption, oxygen production, and water utilization. The shape and size, mass, and energy requirements in relation to the overall integrity of the biomass production chamber are under constant study. Author

N93-13997*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
SCENARIOS FOR OPTIMIZING POTATO PRODUCTIVITY IN A LUNAR CELSS
R. M. WHEELER, R. C. MORROW (Wisconsin Univ., Madison.), T. W. TIBBITTS (Wisconsin Univ., Madison.), and R. J. BULA (Wisconsin Univ., Madison.) *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 543-546 Sep. 1992
Avail: CASI HC A01/MF A03

The use of controlled ecological life support system (CELSS) in the development and growth of large-scale bases on the Moon will reduce the expense of supplying life support materials from Earth. Such systems would use plants to produce food and oxygen, remove carbon dioxide, and recycle water and minerals. In a lunar CELSS, several factors are likely to be limiting to plant productivity, including the availability of growing area, electrical power, and lamp/ballast weight for lighting systems. Several management scenarios are outlined in this discussion for the production of potatoes based on their response to irradiance, photoperiod, and carbon dioxide concentration. Management scenarios that use 12-hr photoperiods, high carbon dioxide concentrations, and movable lamp banks to alternately irradiate halves of the growing area appear to be the most efficient in terms of growing area, electrical power, and lamp weights. However, the optimal scenario will be dependent upon the relative 'costs' of each factor.
Author

N93-13998*# Wisconsin Univ., Madison. Center for Space Automation and Robotics.
POTENTIAL OF DERIVED LUNAR VOLATILES FOR LIFE SUPPORT
R. J. BULA, L. J. WITTENBERG, T. W. TIBBITTS, and G. L. KULCINSKI *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 547-550 Sep. 1992
Avail: CASI HC A01/MF A03

The lunar regolith contains small quantities of solar wind implanted volatile compounds that have vital, basic uses for maintaining life support systems of lunar or space settlements. Recent proposals to utilize the helium-3 isotope (He-3) derived from the lunar regolith as a fuel for fusion reactors would result in the availability of large quantities of other lunar volatile compounds. The quantities obtained would provide the annual life support replacement requirements of 1150 to 23,000 inhabitants per ton of He-3 recovered, depending on the volatile compound. Utilization of the lunar volatile compounds for life support depends on the costs, in terms of materials and energy, associated with their extraction from the lunar regolith as compared to the delivery costs of these compounds from Earth resources. Considering today's conservative estimated transportation costs ($10,000 dollars per kilogram) and regolith mining costs ($5 dollars per ton), the life support replacement requirements could be more economically supplied by recovering the lunar volatile compounds than transporting these materials from Earth resources, even before He-3 will be utilized as a fusion fuel. In addition, availability of lunar volatile compounds could have a significant cost impact on maintaining the life support systems of the space station and a Mars base. Author

N93-13999*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
TECHNOLOGY DEVELOPMENT FOR LUNAR BASE WATER RECYCLING
JOHN R. SCHULTZ (Krug International, Houston, TX.) and RICHARD L. SAUER *In its* The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 551-557 Sep. 1992
Avail: CASI HC A02/MF A03

This paper will review previous and ongoing work in aerospace

water recycling and identify research activities required to support development of a lunar base. The development of a water recycle system for use in the life support systems envisioned for a lunar base will require considerable research work. A review of previous work on aerospace water recycle systems indicates that more efficient physical and chemical processes are needed to reduce expendable and power requirements. Development work on biological processes that can be applied to microgravity and lunar environments also needs to be initiated. Biological processes are inherently more efficient than physical and chemical processes and may be used to minimize resupply and waste disposal requirements. Processes for recovering and recycling nutrients such as nitrogen, phosphorus, and sulfur also need to be developed to support plant growth units. The development of efficient water quality monitors to be used for process control and environmental monitoring also needs to be initiated. Author

N93-14000*# North Dakota Univ., Grand Forks. Energy and Environmental Research Center.
PLASMA REACTOR WASTE MANAGEMENT SYSTEMS
ROBERT O. NESS, JR., JOHN R. RINDT, and SUMITRA R. NESS *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 559-562 Sep. 1992
Avail: CASI HC A01/MF A03

The University of North Dakota is developing a plasma reactor system for use in closed-loop processing that includes biological, materials, manufacturing, and waste processing. Direct-current, high-frequency, or microwave discharges will be used to produce plasmas for the treatment of materials. The plasma reactors offer several advantages over other systems, including low operating temperatures, low operating pressures, mechanical simplicity, and relatively safe operation. Human fecal material, sunflowers, oats, soybeans, and plastic were oxidized in a batch plasma reactor. Over 98 percent of the organic material was converted to gaseous products. The solids were then analyzed and a large amount of water and acid-soluble materials were detected. These materials could possibly be used as nutrients for biological systems. Author

N93-14001*# North Dakota Univ., Grand Forks.
DISTRIBUTION OF HUMAN WASTE SAMPLES IN RELATION TO SIZING WASTE PROCESSING IN SPACE
DICK PARKER and S. K. GALLAGHER (Agricultural Research Service, Grand Forks, ND.) *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 563-568 Sep. 1992
Avail: CASI HC A02/MF A03

Human waste processing for closed ecological life support systems (CELSS) in space requires that there be an accurate knowledge of the quantity of wastes produced. Because initial CELSS will be handling relatively few individuals, it is important to know the variation that exists in the production of wastes rather than relying upon mean values that could result in undersizing equipment for a specific crew. On the other hand, because of the costs of orbiting equipment, it is important to design the equipment with a minimum of excess capacity because of the weight that extra capacity represents. A considerable quantity of information that had been independently gathered on waste production was examined in order to obtain estimates of equipment sizing requirements for handling waste loads from crews of 2 to 20 individuals. The recommended design for a crew of 8 should hold 34.5 liters per day (4315 ml/person/day) for urine and stool water and a little more than 1.25 kg per day (154 g/person/day) of human waste solids and sanitary supplies. Author

N93-14003*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
CONCEPTUAL DESIGN OF A LUNAR BASE THERMAL CONTROL SYSTEM
LISA C. SIMONSEN, MARC J. DEBARRO (Rockwell International Corp., Downey, CA.), and JEFFERY T. FARMER *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 579-591 Sep. 1992
Avail: CASI HC A03/MF A03

Space station and alternate thermal control technologies were evaluated for lunar base applications. The space station technologies consisted of single-phase, pumped water loops for sensible and latent heat removal from the cabin internal environment and two-phase ammonia loops for the transportation and rejection of these heat loads to the external environment. Alternate technologies were identified for those areas where space station technologies proved to be incompatible with the lunar environment. Areas were also identified where lunar resources could enhance the thermal control system. The internal acquisition subsystem essentially remained the same, while modifications were needed for the transport and rejection subsystems because of the extreme temperature variations on the lunar surface. The alternate technologies examined to accommodate the high daytime temperatures incorporated lunar surface insulating blankets, heat pump system, shading, and lunar soil. Other heat management techniques, such as louvers, were examined to prevent the radiators from freezing. The impact of the geographic location of the lunar base and the orientation of the radiators was also examined. A baseline design was generated that included weight, power, and volume estimates. Author

N93-14013*# Lockheed Engineering and Sciences Co., Houston, TX.
OCCUPATIONAL ERGONOMICS IN SPACE
J. STRAMLER *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 659-663 Sep. 1992
Avail: CASI HC A01/MF A03

Ergonomics is often defined simply as the study of work. Related or synonymous terms include human factors, human engineering, engineering psychology, and others. Occupational ergonomics is a term that has been proposed to describe the study of the working environment, including the physical consequences resulting from having an improperly designed workplace. The routine space working environment presents some problems not found in the typical Earthbound workplace. These include radiation, intravehicular contamination/pollution, temperature extremes, impact with other objects, limited psychosocial relationships, sensory deprivation, and reduced gravity. These are important workplace considerations, and may affect astronauts either directly at work or at some point during their life as a result of their work under these conditions. Some of the major issues associated with each of these hazards are presented. Author

N93-14014*# Schmitt (Harrison H.), Albuquerque, NM.
THE REAL WORLD AND LUNAR BASE ACTIVATION SCENARIOS
HARRISON H. SCHMITT *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 667-671 Sep. 1992
Avail: CASI HC A01/MF A03

A lunar base or a network of lunar bases may have highly desirable support functions in a national or international program to explore and settle Mars. In addition, He-3 exported from the Moon could be the basis for providing much of the energy needs of humankind in the twenty-first century. Both technical and managerial issues must be addressed when considering the establishment of a lunar base that can serve the needs of human civilization in space. Many of the technical issues become evident in the consideration of hypothetical scenarios for the activation of a network of lunar bases. Specific and realistic assumptions must be made about the conduct of various types of activities in addition to the general assumptions given above. These activities include landings, crew consumables, power production, crew selection, risk management, habitation, science station placement, base planning, science, agriculture, resource evaluation, readaptation, plant activation and test, storage module landings, resource transport module landings, integrated operations, maintenance, Base 2 activation, and management. The development of scenarios

for the activation of a lunar base or network of bases will require close attention to the 'real world' of space operations. That world is defined by the natural environment, available technology, realistic objectives, and common sense. Author

N93-14018*# North Dakota Univ., Grand Forks. Dept. of Space Studies.
THE PROVINCE AND HERITAGE OF MANKIND RECONSIDERED: A NEW BEGINNING
J. I. GABRYNOWICZ *In* NASA. Johnson Space Center, The Second Conference on Lunar Bases and Space Activities of the 21st Century, Volume 2 p 691-695 Sep. 1992
Avail: CASI HC A01/MF A03

The central problem of our time -- one that is shared by all races and nationalities -- is to discover the things, the qualities, and interest that people have in common so that durable institutions can be designed for mankind's survival. The 'common heritage of mankind' and the 'province of all mankind' are different legal concepts developed in international space law during the last quarter of a century. Since the initial appearance of these provisions, controversy has arisen regarding their intent and meaning as applied to a nation's right to explore and use a common environment such as space or the high seas and a nation's obligation to share benefits derived from those environments with the rest of the world. As can be expected, different interpretations are currently competing for acceptance. This is so, in part, because, in the case of the Outer Space Treaty, although a general principle was articulated, rules for acceptance and application of the principles were not. In the case of the Moon and Sea Treaties, although an effort has been made to clarify both meaning and application, the articulations are still too vague for legal certainty. This paper focuses on the fact that these concepts are already currently available tools for the advancement of both global and U.S. interests but, because of the labyrinthine legal arguments that have been generated and some assumptions being held, they are in danger of being lost as such tools. The tendency of many observers in the U.S. to confuse the concept of 'province of all mankind' and 'common heritage of mankind' and to assume that both are incompatible with U. S. commercial space interests is also addressed. It is suggested that reconsidering these provisions can yield positions compatible with U.S. interests and that it can and should actively seek the use of these provisions as a basis for global cooperation and commercial benefit. Author

N93-14090# Army Aeromedical Research Lab., Fort Rucker, AL.
THE RELATIONSHIP BETWEEN ENVIRONMENTAL CONDITIONS AND UH-60 COCKPIT TEMPERATURE Final Report, May 1990 - May 1992
ROBERT THORNTON and FRANK GUARDIANI Jul. 1992 51 p
(AD-A255918; USAARL-92-25) Avail: CASI HC A04/MF A01

Data have been collected in the UH-60 helicopter in various flight configurations (hover, contour (250 ft), and cruise (650 ft)) to relate the thermal conditions found in the cockpit to data available to commanders and researchers in the field. These have been used to develop equations for use in future thermal modeling studies and to provide information to increase the fidelity of helicopter environmental simulations. GRA

N93-14161# National Academy of Sciences - National Research Council, Washington, DC.
BODY COMPOSITION AND PHYSICAL PERFORMANCE
BERNADETTE M. MARRIOTT and JUDITH GRUMSTRUP-SCOTT 1 Aug. 1992 372 p
(Contract DAMD17-92-J-2003; DA PROJ. 3M1-61102-BS-15)
(AD-A255627) Avail: CASI HC A16/MF A03

The relationship of body composition to performance of physical tasks is of major interest to the military. Not only is it important in the decisions of acceptance or rejection of recruits for military service, but it also has significant implications for the individual relating to retention and advancement while in the services. There are financial implications as well for the military services, due to the high cost of training replacements, when individuals are discharged for failure to meet the established standards. The discharge of highly trained and experienced specialists has significant additional implications concerning unit readiness and performance. The application of body composition standards in the military on a rational and equitable basis based on ethnicity, gender, and age is therefore an important issue. GRA

N93-14427# Indiana Univ., Bloomington. Poplars Research and Conference Center.
INSTITUTE FOR THE STUDY OF HUMAN CAPABILITIES Annual Technical Report, 1 Jun. 1991 - 31 May 1992
CHARLES S. WATSON 31 Aug. 1992 74 p
(Contract AF-AFOSR-0215-90)
(AD-A256091; AFOSR-92-0852TR) Avail: CASI HC A04/MF A01

We continue to make significant progress toward our long-term goals. The Institute maintains an inter-laboratory, work-station based computer network. A third conference was held during this funding period, on March 25-27, 1992, again on the subject of Human Error. During the funding period, the university completed rehabilitation of three buildings for use in Institute-related research. Andrew Dillon, from the Human Sciences and Advanced Technology Research Institute in Loughborough, England, collaborated with several groups at the university on human-computer interactions. The institute has provided partial support of research leading to the publication, during the past year, of 46 journal articles and book chapters, and the presentation of 28 papers at meetings of scientific societies, described in this report. GRA

N93-14520# Wright Lab., Wright-Patterson AFB, OH.
THE HUMAN-ELECTRONIC CREW: IS THE TEAM MATURING? THE 2ND JOINT GAF/RAF/USAF WORKSHOP ON HUMAN-ELECTRONIC CREW TEAMWORK
TERRY EMERSON, MICHAEL REINECKE, JOHN REISING, and ROBERT TAYLOR 10 Jul. 1992 184 p Workshop held in Ingolstadt, Germany, 25-28 Sep. 1990
(Contract AF PROJ. 2403)
(AD-A256192; WL-TR-92-3078) Avail: CASI HC A09/MF A02

Advances in artificial intelligence (AI) will enable future fighter/attack aircraft to have a rather unique crew -- one human and one electronic. The objective of the workshop was to bring together AI specialists, aircrew, and cockpit designers in order to exchange ideas relative to (1) the state of the art in aircraft applications of AI technology and (2) the impact on the cockpit of the human/electronic crew. This meeting provided a valuable forum for the experts of several countries to exchange ideas, concepts, and data relative to hardware and software capabilities that can be included in an aircraft system design to aid the human operator in performing the mission. GRA

N93-14548# George Mason Univ., Fairfax, VA. Center for Computational Statistics.
EVALUATION AND ESTIMATION OF HANDLING QUALITIES VIA STATISTICAL MODELING OF PILOT RESPONSE DATA Final Report, 15 Jul. 1989 - 28 Feb. 1991
DONALD T. GANTZ, LAWRENCE C. BALDWIN, and LINDA J. DAVIS Nov. 1991 105 p
(Contract N00014-89-J-3146)
(AD-A255324) Avail: CASI HC A06/MF A02

This report describes a research project which measured pilot response to seven control systems simulating different handling qualities, quantitatively evaluated and compared the systems based on these measurements, and compared the quantitative system evaluation based on measured pilot performance with a qualitative evaluation using the Cooper-Harper technique. The objective of the project is implementation of a methodology for system evaluation via pilot performance to complement the current evaluation technique based on subjective ratings by test pilots. Pilot performance is determined through analysis of objective dynamic measurements of pilot response typical of flight test environments. In short, the methodology specifies a general approach for condensing the typically huge mound of measured

test data accumulated during flight simulation experiments into meaningful quantities for system evaluation. The key element in the methodology is statistical modeling of a law for pilot control. Statistical modeling of pilot control provides an assessment of pilot performance in terms of standard statistical estimation parameters. The methodology requires that this control model be used to compute control input in a closed loop tracking task; the accuracy of the control model in performing this task is an important measure of pilot performance relevant to system evaluation. In addition, these parameters computed from the dynamic measurements of pilot performance are shown to enhance understanding of the aspects of the handling qualities underlying subjective rating techniques such as Cooper-Harper. GRA

N93-14554# Coast Guard Research and Development Center, Groton, CT.
EVALUATION OF NIGHT VISION GOGGLES (NVG) FOR MARITIME SEARCH AND RESCUE (JOINT CANADIAN/US COAST GUARD EXPERIMENT) Interim Report, Mar. 1989 - Feb. 1991
R. Q. ROBE, J. V. PLOURDE, and R. L. MARSEE Nov. 1991 67 p Prepared in cooperation with Analysis and Technology, Inc., New London, CT
(AD-A255525; USCG-D-13-92; USCG-R&DC-03/92) Avail: CASI HC A04/MF A01

Three experiments were conducted in 1989 and three more were conducted in 1990 by the U.S. Coast Guard Research and Development (R&D) Center to evaluate night vision goggles (NVGs) for their effectiveness in detecting small targets at night. Three types of NVGs have been evaluated: the AN/AVS-6 Aviators Night Vision Imaging System (ANVIS) NVG has been tested onboard U.S. Coast Guard HH-3 and CH-3 helicopters, and the AN/PVS-5C and AN/PVS-7A NVGs have been tested onboard U.S. Coast Guard 41-foot utility boats (UTBs) and a U.S. Coast Guard 210-foot medium endurance cutter and a Canadian Coast Guard 234-foot (71.5-meter) ship. During the fall 1990 experiment in the waters of Canso Bank off the coast of Nova Scotia, the medium endurance cutter and Canadian Coast Guard ship were employed in realistically-simulated search missions for 4- and 6-person lighted and unlighted life rafts with retroreflective tape. This interim report discusses the results of the Canso Bank experiment. GRA

N93-14614*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
A VOYAGE TO MARS: A CHALLENGE TO COLLABORATION BETWEEN MAN AND MACHINES
IRVING C. STATLER *In* NAL, Symposium on the Occasion of the Farewell of Prof. Dr. Ir. O. H. Gerlach as Chairman of the Board of the Foundation National Aerospace Laboratory NLR, The Netherlands p 5-29 1991
Avail: CASI HC A03/MF A01

A speech addressing the design of man machine systems for exploration of space beyond Earth orbit from the human factors perspective is presented. Concerns relative to the design of automated and intelligent systems for the NASA Space Exploration Initiative (SEI) missions are largely based on experiences with integrating humans and comparable systems in aviation. The history, present status, and future prospect, of human factors in machine design are discussed in relation to a manned voyage to Mars. Three different cases for design philosophy are presented. The use of simulation is discussed. Recommendations for required research are given. ESA

N93-14651# Dynamics Research Corp., Wilmington, MA. Systems Div.
DEVELOPMENT OF MEASURES OF CREW COORDINATION Final Report, Jan. - Sep. 1990
ROBERT SIMON, DANIEL T. RISER, and EUGENE A. PAWLIK, SR. Jul. 1992 137 p
(Contract DAHC35-89-D-0030)
(AD-A255384; ARI-RN-92-68) Avail: CASI HC A07/MF A02

This report describes the development of a reliable, objective, and quantitative set of metrics for measuring and assessing aircrew coordination in terms of aviator performance and safety. Based on a review of programs to evaluate aircrew coordination in the commercial and military sectors, three rating instruments were developed for specific application to UH-60 helicopter aircrews. These instruments included a military adaptation of the Cockpit Management Attitudes Questionnaire (CMAQ), the Aircrew Coordination Evaluation Checklist, and a revised set of Aircrew Training Manual (ATM) maneuver standards. All three instruments were used by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) to evaluate UH-60 aircrews in May 1990 at Fort Campbell, Kentucky. Data from this experiment are being analyzed by ARI and will provide a basis for developing training standards and methods in this area. GRA

N93-14713* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
PASSIVE ZERO-GRAVITY LEG RESTRAINT Patent
CHRISTOPHER R. MILLER, inventor (to NASA) 12 Sep. 1989 9 p
(NASA-CASE-ARC-11882-1-CU; US-PATENT-4,865,270; US-PATENT-APPL-SN-254052; US-PATENT-CLASS-244-118.5; US-PATENT-CLASS-244-158R; US PATENT-CLASS-244-162; US-PATENT-CLASS-297-423; US-PATENT-CLASS-272-145; INT-PATENT-CLASS-B64G-1/60) Avail: US Patent and Trademark Office

A passive zero or microgravity leg restraint is described which includes a central support post with a top and a bottom. Extending from the central support post are a calf pad tab, to which calf pad is attached, and a foot pad tab, to which foot tab is attached. Also extending from central support post are knee pads. When the restraint is in use the user's legs are forced between pads by a user imposed scissors action of the legs. The user's body is then supported in a zero or microgravity neutral body posture by the leg restraint. The calf pad has semi-ridig elastic padding material covering structural stiffener. The foot pad has padding material and a structural stiffener. Knee pads have s structural tube stiffener at their core.
Official Gazette of the U.S. Patent and Trademark Office

N93-14870* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
BAR-HOLDING PROSTHETIC LIMB Patent
THOMAS W. VEST, inventor (to NASA), WILLIAM E. NORTON, inventor (to NASA), JEWELL G. BELCHER, inventor (to NASA), and JAMES R. CARDEN, inventor (to NASA) 17 Nov. 1992 7 p Filed 15 Apr. 1992 Sponsored by NASA
(NASA-CASE-MFS-28481-1; US-PATENT-5,163,966; US-PATENT-APPL-SN-873931; US-PATENT-CLASS-623-65; US-PATENT-CLASS-623-57; INT-PATENT-CLASS-A61F-2/54)
Avail: US Patent and Trademark Office

A prosthetic device for below-the-elbow amputees is disclosed. The device has a removable effector, which is attached to the end of an arm cuff. The effector is comprised of a pair of C-shaped members that are oriented so as to face each other. Working in concert, the C-shaped members are able to hold a bar such as a chainsaw handle. A flat spring is fitted around the C-shaped members to hold them together.
Official Gazette of the U.S. Patent and Trademark Office

N93-14951# Alberta Research Council, Edmonton.
A MONITORING AND CONTROL SYSTEM FOR COMPLEX MAN-MACHINE SYSTEMS: PRELIMINARY DESIGN
MAHER NESSIM, LYNN SUTHERLAND, BREEN LIBLONG, and VICKITT LAU *In* Canadian Space Agency, Proceedings of the Sixth CASI Conference on Astronautics 13 p 1990 Previously announced in IAA as A91-34957
Avail: Canadian Aeronautics and Space Inst., 222 Somerset St. W., Suite 601, Ottawa, Ontario K2P 0J1 Canada

Complex systems such as the Mobile Servicing System (MSS) consist of many highly interrelated components. Monitoring and control of these systems is an extremely complex task. A software design for the monitoring and control of complex systems is presented. The software uses artificial intelligence and probabilistic

techniques to perform the monitoring and control functions. The system is designed to achieve independence between the generic functional modules and the domain specific knowledge modules so that the resulting software can be applied to a range of physical systems by developing a knowledge base for each case. Candidate systems include the MSS, as well as offshore and marine transportation systems. The software design supports a number of important features, including real-time response, deep and shallow knowledge based reasoning, modelling of uncertainty and an intelligent user interface. The software is expected to interface with up to several hundred sensors and will maintain a performance history for updating and evaluation purposes. The main functional modules of the software system are a monitoring and control planner, a sensor data analyzer, a system status assessment module, a diagnosis module, a control action planner and an updating and reporting module. The approaches proposed to perform the functions of each of these modules are described.
Author (CISTI)

N93-15363# Pennsylvania Univ., Philadelphia. Dept. of Computer and Information Sciences.
MODELING CLOTHED FIGURES Final Report, 1 Aug. 1990 - 30 Jun. 1991
NORMAN I. BADLER 31 Aug. 1992 10 p
(Contract DAAL03-90-G-0191)
(AD-A257037; ARO-28066.1-MA) Avail: CASI HC A02/MF A01

In most workplace environments we have encountered, clothed figures are the norm and would be expected by the designer. Adding clothing to a human figure improves its graphical appearance and realism. Clothes modeling can be done in many ways ranging from very simple to more realistic but complicated. The simplest technique is to change the attributes of certain segments of the body figure; for example, by modifying the colors of the lower legs we get the effect of a body wearing short pants. This is not quite as silly as it sounds, because the body segment geometry can be created with a clothed rather than bare-skinned shape. The best but more complicated approach is to drape and attach clothing over a body to simulate the intricate properties of garments. Besides improving realism, there is a practical human factors aspect to clothing. Clothing constrains movement by restricting the joint angle limits. An approach to analyzing this problem has been developed by using collision detection for a geometric clothes model. GRA

55

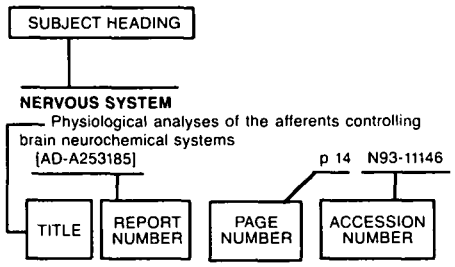
SPACE BIOLOGY

Includes exobiology; planetary biology; and extraterrestrial life.

A93-17435 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.
EXOBIOLOGY SCIENCE OBJECTIVES AT A LUNAR BASE
DONALD L. DEVINCENZI (NASA, Ames Research Center, Moffett Field, CA) and HAROLD P. KLEIN (Santa Clara Univ., CA) *In* A lunar-based chemical analysis laboratory Hampton, VA A. Deepak Publishing 1992 p. 99-110. Research supported by NASA refs
Copyright

Five general categories of experimentation on the moon are reviewed which would provide important scientific information about chemical evolution and the origin and early evolution of life. Attention is given to: (1) chemical analyses of samples for products of prebiotic evolution, (2) analysis of crater records and understanding the implications for the origin and evolution of life on earth, (3) exposure of microbes and organics to the space environment, (4) collection of cosmic dust particles and analysis of volatiles and organics, and (5) observations of planetary environments and the interstellar medium to determine the nature and extent of chemical evolution. C.D.

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The title is used to provide a description of the subject matter. When the title is insufficiently descriptive of document content, a title extension is added, separated from the title by three hyphens. The accession number and the page number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document. Under any one subject heading, the accession numbers are arranged in sequence.

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

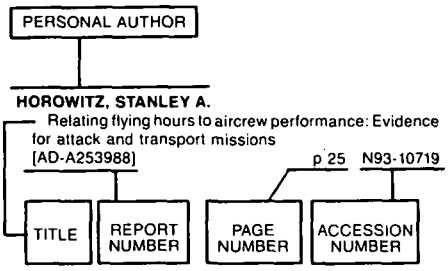
T

U

V

W

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document listed (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the title. Under any one author's name the accession numbers are arranged in sequence.

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

V

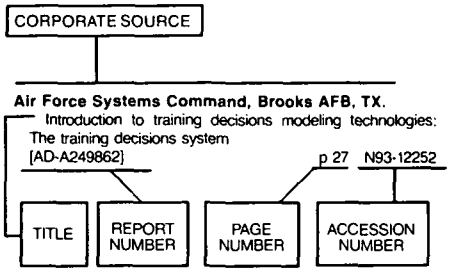
W

X

Y

Z

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

I

J

K

L

M

N

O

P

R

S

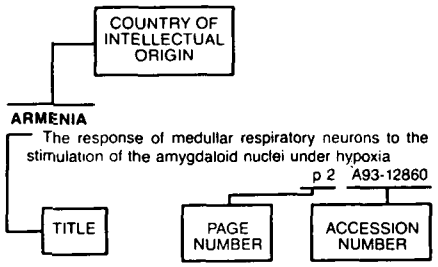
T

U

V

W

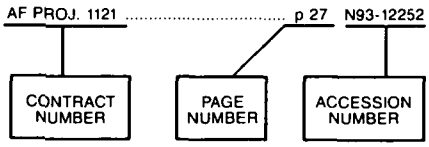
Typical Foreign Technology Index Listing



Listings in this index are arranged alphabetically by country of intellectual origin. The title of the document is used to provide a brief description of the subject matter. The page number and the accession number are included in each entry to assist the user in locating the citation in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

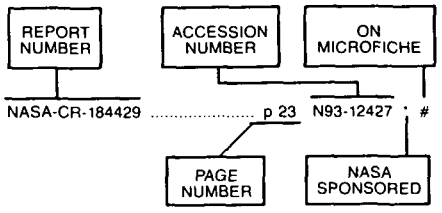
FOREIGN

Typical Contract Number Index Listing



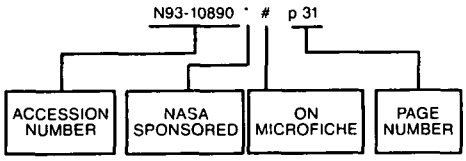
Listings in this index are arranged alphanumerically by contract number. Under each contract number, the accession numbers denoting documents that have been produced as a result of research done under the contract are shown. The accession number denotes the number by which the citation is identified in the abstract section. Preceding the accession number is the page number on which the citation may be found.

Typical Report Number Index Listing



Listings in this index are arranged alphanumerically by report number. The page number indicates the page on which the citation is located. The accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

Typical Accession Number Index Listing



Listings in this index are arranged alphanumerically by accession number. The page number listed to the right indicates the page on which the citation is located. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche.

AVAILABILITY OF CITED PUBLICATIONS

IAA ENTRIES (A93-10000 Series)

Publications announced in *IAA* are available from the AIAA Technical Information Service as follows: Paper copies of accessions are available at $10.00 per document (up to 50 pages), additional pages $0.25 each. Standing order microfiche are available at the rate of $1.45 per microfiche for *IAA* source documents and $1.75 per microfiche for AIAA meeting papers.

Minimum air-mail postage to foreign countries is $2.50. All foreign orders are shipped on payment of pro-forma invoices.

All inquiries and requests should be addressed to: Technical Information Service, American Institute of Aeronautics and Astronautics, 555 West 57th Street, New York, NY 10019. Please refer to the accession number when requesting publications.

STAR ENTRIES (N93-10000 Series)

One or more sources from which a document announced in *STAR* is available to the public is ordinarily given on the last line of the citation. The most commonly indicated sources and their acronyms or abbreviations are listed below, and their addresses are listed on page APP-4. If the publication is available from a source other than those listed, the publisher and his address will be displayed on the availability line or in combination with the corporate source line.

Avail: CASI. Sold by the NASA Center for AeroSpace Information. Prices for hard copy (HC) and microfiche (MF) are indicated by a price code following the letters HC or MF in the *STAR* citation. Current values for the price codes are given in the tables on page APP-5.

NOTE ON ORDERING DOCUMENTS: When ordering publications from CASI, use the N accession number or other report number. It is also advisable to cite the title and other bibliographic identification.

Avail: SOD (or GPO). Sold by the Superintendent of Documents, U.S. Government Printing Office, in hard copy.

Avail: BLL (formerly NLL): British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England. Photocopies available from this organization at the price shown. (If none is given, address inquiry to the BLL.)

Avail: DOE Depository Libraries. Organizations in U.S. cities and abroad that maintain collections of Department of Energy reports, usually in microfiche form, are listed in *Energy Research Abstracts.* Services available from the DOE and its depositories are described in a booklet, *DOE Technical Information Center - Its Functions and Services* (TID-4660), which may be obtained without charge from the DOE Technical Information Center.

Avail: ESDU. Pricing information on specific data, computer programs, and details on Engineering Sciences Data Unit (ESDU) topic categories can be obtained from ESDU International Ltd. Requesters in North America should use the Virginia address while all other requesters should use the London address, both of which are on page APP-4.

Avail: Fachinformationszentrum, Karlsruhe. Gesellschaft fur wissenschaftlich-technische Information mbH 7514 Eggenstein-Leopoldshafen 2, Germany.

Avail: HMSO. Publications of Her Majesty's Stationery Office are sold in the U.S. by Pendragon House, Inc. (PHI), Redwood City, CA. The U.S. price (including a service and mailing charge) is given, or a conversion table may be obtained from PHI.

Avail: Issuing Activity, or Corporate Author, or no indication of availability. Inquiries as to the availability of these documents should be addressed to the organization shown in the citation as the corporate author of the document.

Avail: NASA Public Document Rooms. Documents so indicated may be examined at or purchased from the National Aeronautics and Space Administration (JBD-4), Public Documents Room (Room 1H23), Washington, DC 20546-0001, or public document rooms located at NASA installations, and the NASA Pasadena Office at the Jet Propulsion Laboratory.

Avail: NTIS. Sold by the National Technical Information Service. Initially distributed microfiche under the NTIS SRIM (Selected Research in Microfiche) are available. For information concerning this service, consult the NTIS Subscription Section, Springfield, VA 22161.

Avail: Univ. Microfilms. Documents so indicated are dissertations selected from *Dissertation Abstracts* and are sold by University Microfilms as xerographic copy (HC) and microfilm. All requests should cite the author and the Order Number as they appear in the citation.

Avail: US Patent and Trademark Office. Sold by Commissioner of Patents and Trademarks, U.S. Patent and Trademark Office, at the standard price of $1.50 each, postage free. (See discussion of NASA patents and patent applications below.)

Avail: (US Sales Only). These foreign documents are available to users within the United States from the National Technical Information Service (NTIS). They are available to users outside the United States through the International Nuclear Information Service (INIS) representative in their country, or by applying directly to the issuing organization.

Avail: USGS. Originals of many reports from the U.S. Geological Survey, which may contain color illustrations, or otherwise may not have the quality of illustrations preserved in the microfiche or facsimile reproduction, may be examined by the public at the libraries of the USGS field offices whose addresses are listed on page APP-4. The libraries may be queried concerning the availability of specific documents and the possible utilization of local copying services, such as color reproduction.

FEDERAL DEPOSITORY LIBRARY PROGRAM

In order to provide the general public with greater access to U.S. Government publications, Congress established the Federal Depository Library Program under the Government Printing Office (GPO), with 53 regional depositories responsible for permanent retention of material, inter-library loan, and reference services. At least one copy of nearly every NASA and NASA-sponsored publication, either in printed or microfiche format, is received and retained by the 53 regional depositories. A list of the regional GPO libraries, arranged alphabetically by state, appears on the inside back cover. These libraries are *not* sales outlets. A local library can contact a Regional Depository to help locate specific reports, or direct contact may be made by an individual.

PUBLIC COLLECTION OF NASA DOCUMENTS

An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols # and * from ESA – Information Retrieval Service European Space Agency, 8-10 rue Mario-Nikis, 75738 CEDEX 15, France.

STANDING ORDER SUBSCRIPTIONS

NASA SP-7011 supplements and annual index are available from the NASA Center for AeroSpace Information (CASI). Standing order subscriptions do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.

ADDRESSES OF ORGANIZATIONS

American Institute of Aeronautics and Astronautics
Technical Information Service
555 West 57th Street, 12th Floor
New York, New York 10019

British Library Lending Division,
Boston Spa, Wetherby, Yorkshire,
England

Commissioner of Patents and Trademarks
U.S. Patent and Trademark Office
Washington, DC 20231

Department of Energy
Technical Information Center
P.O. Box 62
Oak Ridge, Tennessee 37830

European Space Agency-Information Retrieval Service
ESRIN
Via Galileo Galilei
00044 Frascati (Rome) Italy

Engineering Sciences Data Unit International
P.O. Box 1633
Manassas, Virginia 22110

Engineering Sciences Data Unit International, Ltd.
251-259 Regent Street
London, W1R 7AD, England

Fachinformationszentrum Karlsruhe
Gesellschaft fur wissenschaftlich-technische
Information mbH
7514 Eggenstein-Leopoldshafen 2, Germany

Her Majesty's Stationery Office
P.O. Box 569, S.E. 1
London, England

NASA Center for AeroSpace Information
800 Elkridge Landing Road
Linthicum Heights, MD 21090-2934

National Aeronautics and Space Administration
Scientific and Technical Information Program (JTT)
Washington, DC 20546-0001

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Pendragon House, Inc.
899 Broadway Avenue
Redwood City, California 94063

Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402

University Microfilms
A Xerox Company
300 North Zeeb Road
Ann Arbor, Michigan 48106

University Microfilms, Ltd.
Tylers Green
London, England

U.S. Geological Survey Library National Center
MS 950
12201 Sunrise Valley Drive
Reston, Virginia 22092

U.S. Geological Survey Library
2255 North Gemini Drive
Flagstaff, Arizona 86001

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

U.S. Geological Survey Library
Box 25046
Denver Federal Center, MS914
Denver, Colorado 80225

CASI PRICE TABLES

(Effective October 1, 1992)

STANDARD PRICE DOCUMENTS

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	$ 9.00	$ 18.00
A02	12.50	25.00
A03	17.00	34.00
A04-A05	19.00	38.00
A06-A09	26.00	52.00
A10-A13	35.00	70.00
A14-A17	43.00	86.00
A18-A21	50.00	100.00
A22-A25	59.00	118.00
A99	69.00	138.00

MICROFICHE

PRICE CODE	NORTH AMERICAN PRICE	FOREIGN PRICE
A01	$ 9.00	$ 18.00
A02	12.50	25.00
A03	17.00	34.00
A04	19.00	38.00
A06	26.00	52.00
A10	35.00	70.00

IMPORTANT NOTICE

CASI Shipping and Handling Charges
U.S. — ADD $3.00 per TOTAL ORDER
Canada and Mexico — ADD $3.50 per TOTAL ORDER
All Other Countries — ADD $7.50 per TOTAL ORDER
Does NOT apply to orders
requesting CASI RUSH HANDLING.
Contact CASI for charge.

*U.S. GOVERNMENT PRINTING OFFICE: 1993-728-150/60029

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA SP-7011(373)		

4. Title and Subtitle	5. Report Date
Aerospace Medicine and Biology A Continuing Bibliography (Supplement 373)	March 1993
	6. Performing Organization Code JTT
7. Author(s)	8. Performing Organization Report No.
	10. Work Unit No.
9. Performing Organization Name and Address NASA Scientific and Technical Information Program	11. Contract or Grant No.
	13. Type of Report and Period Covered Special Publication
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, DC 20546	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This bibliography lists 206 reports, articles and other documents introduced into the NASA scientific and technical information system in February 1993.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Aerospace Medicine Bibliographies Biological Effects	Unclassified - Unlimited Subject Category - 52

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	82	A05/HC

FEDERAL REGIONAL DEPOSITORY LIBRARIES

ALABAMA

AUBURN UNIV. AT MONTGOMERY LIBRARY
Documents Dept.
7300 University Drive
Montgomery, AL 36117-3596
(205) 244-3650 FAX: (205) 244-0678

UNIV. OF ALABAMA
Amelia Gayle Gorgas Library
Govt. Documents
Box 870266
Tuscaloosa, AL 35487-0266
(205) 348-6046 FAX: (205) 348-8833

ARIZONA

DEPT. OF LIBRARY, ARCHIVES, AND PUBLIC RECORDS
Federal Documents
Third Floor State Capitol
1700 West Washington
Phoenix, AZ 85007
(602) 542-4121 FAX: (602) 542-4400; 542-4500

ARKANSAS

ARKANSAS STATE LIBRARY
State Library Services
One Capitol Mall
Little Rock, AR 72201
(501) 682-2869

CALIFORNIA

CALIFORNIA STATE LIBRARY
Govt. Publications Section
914 Capitol Mall - P.O. Box 942837
Sacramento, CA 94237-0001
(916) 322-4572 FAX: (916) 324-8120

COLORADO

UNIV. OF COLORADO - BOULDER
Norlin Library
Govt. Publications
Campus Box 184
Boulder, CO 80309-0184
(303) 492-8834 FAX: (303) 492-2185

DENVER PUBLIC LIBRARY
Govt. Publications Dept. BS/GPD
1357 Broadway
Denver, CO 80203
(303) 571-2135

CONNECTICUT

CONNECTICUT STATE LIBRARY
231 Capitol Avenue
Hartford, CT 06106
(203) 566-4971 FAX: (203) 566-3322

FLORIDA

UNIV. OF FLORIDA LIBRARIES
Documents Dept.
Library West
Gainesville, FL 32611-2048
(904) 392-0366 FAX: (904) 392-7251

GEORGIA

UNIV. OF GEORGIA LIBRARIES
Govt. Documents Dept.
Jackson Street
Athens, GA 30602
(404) 542-8949 FAX: (404) 542-6522

HAWAII

UNIV. OF HAWAII
Hamilton Library
Govt. Documents Collection
2550 The Mall
Honolulu, HI 96822
(808) 948-8230 FAX: (808) 956-5968

IDAHO

UNIV. OF IDAHO LIBRARY
Documents Section
Moscow, ID 83843
(208) 885-6344 FAX: (208) 885-6817

ILLINOIS

ILLINOIS STATE LIBRARY
Reference Dept.
300 South Second
Springfield, IL 62701-1796
(217) 782-7596 FAX: (217) 524-0041

INDIANA

INDIANA STATE LIBRARY
Serials/Documents Section
140 North Senate Avenue
Indianapolis, IN 46204
(317) 232-3678 FAX: (317) 232-3728

IOWA

UNIV. OF IOWA LIBRARIES
Govt. Publications Dept.
Washington & Madison Streets
Iowa City, IA 52242
(319) 335-5926 FAX: (319) 335-5830

KANSAS

UNIV. OF KANSAS
Govt. Documents & Map Library
6001 Malatt Hall
Lawrence, KS 66045-2800
(913) 864-4660 FAX: (913) 864-5380

KENTUCKY

UNIV. OF KENTUCKY LIBRARIES
Govt. Publications/Maps Dept.
Lexington, KY 40506-0039
(606) 257-3139 FAX: (606) 257-1563; 257-8379

LOUISIANA

LOUISIANA STATE UNIV.
Middleton Library
Govt. Documents Dept.
Baton Rouge, LA 70803
(504) 388-2570 FAX: (504) 388-6992

LOUISIANA TECHNICAL UNIV.
Prescott Memorial Library
Govt. Documents Dept.
305 Wisteria Street
Ruston, LA 71270-9985
(318) 257-4962 FAX: (318) 257-2447

MAINE

TRI-STATE DOCUMENTS DEPOSITORY
Raymond H. Fogler Library
Govt. Documents & Microforms Dept.
Univ. of Maine
Orono, ME 04469
(207) 581-1680

MARYLAND

UNIV. OF MARYLAND
Hornbake Library
Govt. Documents/Maps Unit
College Park, MD 20742
(301) 454-3034 FAX: (301) 454-4985

MASSACHUSETTS

BOSTON PUBLIC LIBRARY
Govt. Documents Dept.
666 Boylston Street
Boston, MA 02117
(617) 536-5400 ext. 226
FAX: (617) 267-8273; 267-8248

MICHIGAN

DETROIT PUBLIC LIBRARY
5201 Woodward Avenue
Detroit, MI 48202-4093
(313) 833-1440; 833-1409
FAX: (313) 833-5039

LIBRARY OF MICHIGAN
Govt. Documents Unit
P.O. Box 30007
Lansing, MI 48909
(517) 373-0640 FAX: (517) 373-3381

MINNESOTA

UNIV. OF MINNESOTA
Wilson Library
Govt. Publications Library
309 19th Avenue South
Minneapolis, MN 55455
(612) 624-5073 FAX: (612) 626-9353

MISSISSIPPI

UNIV. OF MISSISSIPPI
J.D. Williams Library
Federal Documents Dept.
106 Old Gym Bldg.
University, MS 38677
(601) 232-5857 FAX: (601) 232-5453

MISSOURI

UNIV. OF MISSOURI - COLUMBIA
Ellis Library
Govt. Documents
Columbia, MO 65201
(314) 882-6733 FAX: (314) 882-8044

MONTANA

UNIV. OF MONTANA
Maureen & Mike Mansfield Library
Documents Div.
Missoula, MT 59812-1195
(406) 243-6700 FAX: (406) 243-2060

NEBRASKA

UNIV. OF NEBRASKA - LINCOLN
D.L. Love Memorial Library
Documents Dept.
Lincoln, NE 68588
(402) 472-2562

NEVADA

UNIV. OF NEVADA
Reno Library
Govt. Publications Dept.
Reno, NV 89557
(702) 784-6579 FAX: (702) 784-1751

NEW JERSEY

NEWARK PUBLIC LIBRARY
U.S. Documents Div.
5 Washington Street - P.O. Box 630
Newark, NJ 07101-0630
(201) 733-7812 FAX: (201) 733-5648

NEW MEXICO

UNIV. OF NEW MEXICO
General Library
Govt. Publications Dept.
Albuquerque, NM 87131-1466
(505) 277-5441 FAX: (505) 277-6019

NEW MEXICO STATE LIBRARY
325 Don Gaspar Avenue
Santa Fe, NM 87503
(505) 827-3826 FAX: (505) 827-3820

NEW YORK

NEW YORK STATE LIBRARY
Documents/Gift & Exchange Section
Federal Depository Program
Cultural Education Center
Albany, NY 12230
(518) 474-5563 FAX: (518) 474-5786

NORTH CAROLINA

UNIV. OF NORTH CAROLINA - CHAPEL HILL
CB#3912, Davis Library
BA/SS Dept.—Documents
Chapel Hill, NC 27599
(919) 962-1151 FAX: (919) 962-0484

NORTH DAKOTA

NORTH DAKOTA STATE UNIV. LIBRARY
Documents Office
Fargo, ND 58105
(701) 237-8886 FAX: (701) 237-7138
In cooperation with Univ. of North Dakota, Chester Fritz Library
Grand Forks

OHIO

STATE LIBRARY OF OHIO
Documents Dept.
65 South Front Street
Columbus, OH 43266
(614) 644-7051 FAX: (614) 752-9178

OKLAHOMA

OKLAHOMA DEPT. OF LIBRARIES
U.S. Govt. Information Div.
200 NE 18th Street
Oklahoma City, OK 73105-3298
(405) 521-2502, ext. 252, 253
FAX: (405) 525-7804

OKLAHOMA STATE UNIV.
Edmon Low Library
Documents Dept.
Stillwater, OK 74078
(405) 744-6546 FAX: (405) 744-5183

OREGON

PORTLAND STATE UNIV.
Millar Library
934 SW Harrison - P.O. Box 1151
Portland, OR 97207
(503) 725-3673 FAX: (503) 725-4527

PENNSYLVANIA

STATE LIBRARY OF PENN.
Govt. Publications Section
Walnut St. & Commonwealth Ave. - P.O. Box 1601
Harrisburg, PA 17105
(717) 787-3752

SOUTH CAROLINA

CLEMSON UNIV.
Cooper Library
Public Documents Unit
Clemson, SC 29634-3001
(803) 656-5174 FAX: (803) 656-3025
In cooperation with Univ. of South Carolina, Thomas Cooper Library, Columbia

TENNESSEE

MEMPHIS STATE UNIV. LIBRARIES
Govt. Documents
Memphis, TN 38152
(901) 678-2586 FAX: (901) 678-2511

TEXAS

TEXAS STATE LIBRARY
United States Documents
P.O. Box 12927 - 1201 Brazos
Austin, TX 78711
(512) 463-5455 FAX: (512) 463-5436

TEXAS TECH. UNIV. LIBRARY
Documents Dept.
Lubbock, TX 79409
(806) 742-2268 FAX: (806) 742-1920

UTAH

UTAH STATE UNIV.
Merrill Library & Learning Resources Center, UMC-3000
Documents Dept.
Logan, UT 84322-3000
(801) 750-2684 FAX: (801) 750-2677

VIRGINIA

UNIV. OF VIRGINIA
Alderman Library
Govt. Documents
Charlottesville, VA 22903-2498
(804) 924-3133 FAX: (804) 924-4337

WASHINGTON

WASHINGTON STATE LIBRARY
Document Section
MS AJ-11
Olympia, WA 98504-0111
(206) 753-4027 FAX: (206) 753-3546

WEST VIRGINIA

WEST VIRGINIA UNIV. LIBRARY
Govt. Documents Section
P.O. Box 6069
Morgantown, WV 26506
(304) 293-3640

WISCONSIN

ST. HIST. SOC. OF WISCONSIN LIBRARY
Govt. Publications Section
816 State Street
Madison, WI 53706
(608) 262-2781 FAX: (608) 262-4711
In cooperation with Univ. of Wisconsin-Madison, Memorial Library

MILWAUKEE PUBLIC LIBRARY
Documents Div.
814 West Wisconsin Avenue
Milwaukee, WI 53233
(414) 278-2167 FAX: (414) 278-2137

National Aeronautics and
Space Administration
Code JTT
Washington, D.C.
20546-0001

Official Business

Penalty for Private Use, $300

BULK RATE
POSTAGE & FEES PAID
NASA
Permit No. G-27

NASA

POSTMASTER: If Undeliverable (Section 158 Postal Manual) Do Not Return